Facility:	Three Mile Island	Task No.:	AOP602001
Task Title:	PERFORM A MANUAL POWER RANGE CALCULATION	JPM No.:	2012 NRC JPM RO A1-1
K/A Reference:	2.1.37 4.3 / 4.6		New JPM for ILT 10-02 NRC Exam

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- You are the third Reactor Operator.
- The instructor/examiner will act as the CRS.
- The Reactor is at 100% power, with ICS in full automatic.
- The Plant Computer is unavailable and has been off-line for 25 hours.
- NI-7 is Out of Service.
- No maintenance or surveillance items are in progress.
- Core Thermal Power has been calculated to be 99.9% IAW 1103-16, HEAT BALANCE CALCULATIONS.
- Incore Imbalance has been calculated to be 3% IAW OP-TM-300-202, QUADRANT POWER TILT AND AXIAL POWER IMBALANCE USING THE OUT-OF-CORE DETECTOR SYSTEM.
- Recalibration of the NI's is not required.
- The following items are available for your use:
  - An Examinee Data Sheet containing the current NI power level and imbalance.
  - Calculator

Task Standard: All critical tasks evaluated as SAT.

Required Materials:	1302-1.1, Power Range Calibration, Rev 58B Examinee Data Sheet containing the current NI power level and imbalance. Calculator
General References:	1302-1.1, Power Range Calibration, Rev 58B
Initiating Cue:	The CRS has directed you to manually check Power Range calibration using hand calculations IAW 1302-1.1.
Time Critical Task:	N/A
Validation Time:	25 minutes

SIMULATOR SETUP

Exam Setup: N/A

- N/A

- MALFUNCTIONS:

N/A

- OVERRIDES:

N/A

(Denote Critical Steps with a check mark)

START TIME: ________

Evaluator's Cue: **Provide the operator with a copy of 1302-1.1, Power Range Calibration.**

1302-1.1 Step 8.1.1

Performance Step: 1 Prerequisite:
- Reactor Power > 15%
- A/B OTSG Blowdown is secured.

Standard: Examinee determines from initial conditions that power is >15% and that OTSG Blowdown is secured.

Comment:

Procedure Note: - If reperforming Section 8.2 because plant conditions are not consistent with those used to generate Data Sheet 1, then additional SDR need not be generated per 8.2.3.

- If reperforming Section 8.3 because plant conditions are not consistent with those used to generate Data Sheet 2, then additional SDR need not be generated per 8.3.7.

1302-1.1 Step 8.1.2

Performance Step: 2 Procedure
- Preferable method is by computer, Section 8.2. If computer is used, go to Section 8.2 and N/A Section 8.3.

- If computer is inoperable, go to Section 8.3 to perform hand calculations and N/A Section 8.2.

Standard: Examinee determines from the initial conditions that the computer is not available, N/A's section 8.2 and goes to Section 8.3.

Comment:

1302-1.1 Step 8.3.1 and 8.3.2

Performance Step: 3 Reviews Limits, Precautions, and Prerequisites.

Standard: Examinee determines that Limits, Precautions, and Prerequisites are met.

Comment:

Procedure Note: Steps 1 - 5 may be performed in any order.

1302-1.1 Step 8.3.3.(1)

Performance Step: 4 Calculate Core Thermal Power using 1103-16 and RECORD on Data Sheet 2.

Standard: Examinee determines Core Thermal Power to be 99.9% from the initial conditions and records the data on Data Sheet 2.

Comment:

1302-1.1 Step 8.3.3.(2)

Performance Step: 5 Calculate Incore Imbalance using OP-TM-300-202 or OP-TM-300-203 and RECORD on Data Sheet 2.

Standard: Examinee determines Imbalance to be 3% from the initial conditions and records the data on Data Sheet 2.

Comment:

Evaluator Cue: **When the examinee discusses the need to attach Data Sheets from 1103-16 and OP-TM-300-202, inform the examinee that another RO will do that IAW Step 8.3.3.(3)**

1302-1.1 Step 8.3.3.(4)

Performance Step: 6 Record console indications for out-of-core total power on Data Sheet 2.

Standard: Examinee determines power level from Examinee Data Sheet and records the information on Data Sheet 2.

Comment:

1302-1.1 Step 8.3.3.(5)

Performance Step: 7 **RECORD** console indications for out-of-core imbalance on Data Sheet 2.

Standard: Examinee determines Out-of-Core Detector Imbalance from Examinee Data Sheet and records the information on Data Sheet 2.

Comment:

1302-1.1 Step 8.3.3.(6).1

√ **Performance Step: 8** PERFORM calculations for Error Linear Power (ELP)

Standard: Examinee performs calculations for Error Linear Power (ELP)

√ ELP5 = P5-T

= 99.1-99.9

= -0.8

√ ELP6 = P6-T

= 97.8-99.9

= -2.1

ELP7 = P7-T

= N/A

√ ELP8 = P8-T

= 98.3-99.9

= -1.6

Comment:

1302-1.1 Step 8.3.3.(6).2

√ **Performance Step: 9** PERFORM calculations for Offset Error (OE)

Standard: Examinee performs calculations for Offset Error (OE)

√ OE5 = 100/T[I5-(Ix1.000)]
= 100/99.9[3-(3x1.000)]
= 1.00(3-3)
= 0

√ OE6 = 100/T[I6-(Ix1.000)]
= 100/99.9[2.1-(3x1.000)]
= 1.00(2.1-3)
= -0.9

OE7 = 100/T[I7-(Ix1.000)]
= N/A

√ OE8 = 100/T[I8-(Ix1.000)]
= 100/99.9[2.7-(3x1.000)]
= 1.00(2.7-3)
= -0.3

Comment:

1302-1.1 Step 8.3.3.(6).3 and .4

Performance Step: 10 Answer questions on Data Sheet 2.

Standard: Examinee answers NO to "ELP <2% for all channels" and YES to "O.S. Error <2.5% for all channels" (student may answer NO based on NI-7 being OOS).

Comment:

Evaluator's Note: **If the examinee decides to follow guidance of WC-TM-430, state that WC-TM-430 has been completed.**

1302-1.1 Step 8.3.3.(7)

Performance Step: 11 If any answers to Data Sheet 2 questions are NO and reactor power is > 15%, follow guidance of WC-TM-430.

Standard: Examinee determines that No was answered and decides to follow guidance of WC-TM-430.

Comment:

1302-1.1 Step 8.3.3.(8)

√ **Performance Step: 12** Calculate linear amplifier correction factors per Data Sheet 2 for channels that failed, otherwise N/A.

Standard: Examinee calculates linear amplifier correction factor for NI-6.

√ LA1 Correction Factor

= [(Tx3.614) + (Ix1.000)] / [(P6x3.614) + I6]

= [(99.9x3.614) + (3x1.000)] / [(97.8x3.614) + 2.1]

= [361.038 + 3] / [353.449 + 2.1]

= 364.038 / 355.549

= 1.023

√ LA2 Correction Factor

= [(Tx3.614) - (Ix1.000)] / [(P6x3.614) - I6]

= [(99.9x3.614) - (3x1.000)] / [(97.8x3.614) - 2.1]

= [361.038 - 3] / [353.449 - 2.1]

= 358.038 / 351.349

= 1.019

Comment:

Evaluator's Note: **If the examinee decides that I&C must be contacted for an adjustment, state that I&C have been contacted and will begin shortly.**

1302-1.1 Step 8.3.3.(9)

Performance Step: 13 **If** required, have I&C adjust power range linear amplifier per Section 8.4, except as noted below or in accordance with Step 8.4.1.11. N/A if **no** adjustments needed.

_____ a. **If** below 40% full power and/or during transient imbalance conditions, avoid adjustment of NI's solely for incore imbalance. **NOTIFY** Reactor Engineering if the offset limit is exceeded, otherwise N/A.

_____ b. **If** plant stability does **not** permit calibration to within ± 1% of computer read-out, and reactor power is ≥90%, **VERIFY** Error Linear Power is within ± 2%, otherwise N/A.

_____ c. **If** reactor power is < 90%, **VERIFY** Error Linear Power is within +4%, -2%, otherwise N/A.

Standard: Examinee determines the step is valid and that I&C must be contacted for an adjustment.

Comment:

1302-1.1 Step 8.3.3.(10)

Performance Step: 14 NOTIFY Control Room Supervisor of power range calibration check results and that it is complete.

Standard: Examinee notifies the CRS that the power range calibration check is complete.

Comment:

Terminating Cue: **After the CRS is notified: Evaluation on this JPM is complete.**

STOP TIME: ____________ **TIME CRITICAL STOP TIME:** N/A

JPM CUE SHEET

Job Performance Measure No.: 2012 TMI NRC JPM RO A1-1

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

ANSWER KEY – DO *NOT* HAND TO STUDENT

	TMI - Unit 1 Surveillance Procedure	Number 1302-1.1
Title **Power Range Calibration**		Revision No. 58

DATA SHEET 2 Page 1 of 3

Hand Calculated Values

> **NOTE**
> If any NI is OOS, N/A the data and calculation for that NI.

8.3.1/8.4.17(1) Core Thermal Power (T) from 1103-16 (%):

T = 99.9 %

8.3.2/8.4.17(2) Incore Imbalance (I) from OP-TM-300-202 or OP-TM-300-203 (%):

I = 3.0 %

8.3.4 Out-of-core total power (P) from console indicators (%):

P5 = 99.1 % (NI5)

P6 = 97.8 % (NI6)

P7 = N/A % (NI7)

P8 = 98.3 % (NI8)

8.3.5 Out-of-core Imbalance (I) from console indicators (%):

I5 = +3.0 % (NI5)

I6 = +2.1 % (NI6)

I7 = N/A % (NI7)

I8 = +2.7 % (NI8)

8.3.6/8.4.17(4) 1. Error Linear Power (ELP) (%):

ELP5 = P5 - T = -0.8 %

ELP6 = P6 - T = -2.1 %

ELP7 = P7 - T = N/A %

ELP8 = P8 - T = -1.6 %

ANSWER KEY – DO NOT HAND TO STUDENT

ANSWER KEY – DO NOT HAND TO STUDENT

ANSWER KEY – DO *NOT* HAND TO STUDENT

ANSWER KEY – DO *NOT* HAND TO STUDENT

	TMI - Unit 1 Surveillance Procedure	Number 1302-1.1
Title **Power Range Calibration**		Revision No. **58**

DATA SHEET 2 Page 2 of 3

8.3.6/8.4.17(4) Offset Error (OE) (%):

$OE5 = \frac{100}{T}[I5 - (I \times 1.000)] =$ 0 %

$OE6 = \frac{100}{T}[I6 - (I \times 1.000)] =$ -0.9 %

$OE7 = \frac{100}{T}[I7 - (I \times 1.000)] =$ N/A %

$OE8 = \frac{100}{T}[I8 - (I \times 1.000)] =$ -0.3 %

3. Is absolute value of ELP ≤ 2% for all channels? _____YES X NO

4. Is absolute value of O.S. Error ≤ 2.5% for all channels? X YES _____NO

8.3.7 Linear Amplifier Correction Factors.

1. NI5:

LA1 Correction Factor = $\frac{[(T \times 3.451) + (I \times 1.000)]}{[(P5 \times 3.451) + I5]}$ = ________

LA2 Correction Factor = $\frac{[(T \times 3.451) - (I \times 1.000)]}{[(P5 \times 3.451) - I5]}$ = ________

2. NI6:

LA1 Correction Factor = $\frac{[(T \times \cancel{3.542}\ 3.614) + (I \times 1.000)]}{[(P6 \times \cancel{3.542}\ 3.614) + I6]}$ = 1.023

LA2 Correction Factor = $\frac{[(T \times \cancel{3.542}\ 3.614) - (I \times 1.000)]}{[(P6 \times \cancel{3.542}\ 3.614) - I6]}$ = 1.019

3. NI7:

LA1 Correction Factor = $\frac{[(T \times \cancel{3.671}\ 3.974) + (I \times 1.000)]}{[(P7 \times \cancel{3.671}\ 3.974) + I7]}$ = ________

LA2 Correction Factor = $\frac{[(T \times \cancel{3.671}\ 3.974) - (I \times 1.000)]}{[(P7 \times \cancel{3.671}\ 3.974) - I7]}$ = ________

ANSWER KEY – DO *NOT* HAND TO STUDENT

ANSWER KEY – DO *NOT* HAND TO STUDENT

ANSWER KEY – DO *NOT* HAND TO STUDENT

ANSWER KEY – DO *NOT* HAND TO STUDENT

	TMI - Unit 1 Surveillance Procedure	Number 1302-1.1
Title Power Range Calibration		Revision No. 58

DATA SHEET 2 Page 3 of 3

8.3.7 (cont'd)

4. NI8:

LA1 Correction Factor = $\frac{[(T \times 3.757) + (I \times 1.000)]}{[(P8 \times 3.757) + I8]}$ = ________

LA2 Correction Factor = $\frac{[(T \times 3.757) - (I \times 1.000)]}{[(P8 \times 3.757) - I8]}$ = ________

Performed by: ______________________ DATE: ________

Independent Verification of Calculations: ______________________ DATE: ________

Approved by: ______________________ DATE: ________

ANSWER KEY – DO *NOT* HAND TO STUDENT

ANSWER KEY – DO *NOT* HAND TO STUDENT

ANSWER KEY – DO *NOT* HAND TO STUDENT

INITIAL CONDITIONS:

- You are the third Reactor Operator.
- The instructor/examiner will act as the CRS.
- The Reactor is at 100% power, with ICS in full automatic.
- The Plant Computer is unavailable and has been off-line for 25 hours.
- NI-7 is Out of Service.
- No maintenance or surveillance items are in progress.
- Core Thermal Power has been calculated to be 99.9% IAW 1103-16, HEAT BALANCE CALCULATIONS.
- Incore Imbalance has been calculated to be 3% IAW OP-TM-300-202, QUADRANT POWER TILT AND AXIAL POWER IMBALANCE USING THE OUT-OF-CORE DETECTOR SYSTEM.
- Recalibration of the NI's is not required.
- The following items are available for your use:
  - An Examinee Data Sheet containing the current NI power level and imbalance.
  - Calculator

INITIATING CUE: The CRS has directed you to manually check Power Range calibration using hand calculations IAW 1302-1.1.

Time Critical: No

EXAMINEE DATA SHEET

Data obtained on: Date: Today Time: t - 30 mins.

PRESENT OUT-OF-CORE POWER (CC)

NI-5 Core Power	99.1%
NI-6 Core Power	97.8%
NI-7 Core Power	OOS
NI-8 Core Power	98.3%

PRESENT OUT-OF-CORE IMBALANCE (CC)

NI-5 Imbalance	+3.0%
NI-6 Imbalance	+2.1%
NI-7 Imbalance	OOS
NI-8 Imbalance	+2.7%

Facility: Three Mile Island

Task No.: 22001027

Task Title: PERFORM A TRANSIENT LEAK RATE CALCULATION

JPM No.: 2012 NRC JPM RO A1-2

K/A Reference: 2.1.23 4.3 / 4.4

Modified from Bank JPM TQ-TM-104-ADM-OS24-J100

Examinee:

NRC Examiner:

Facility Evaluator:

Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- You are the URO
- The instructor/examiner will act as the CRS.
- The Reactor is at 100% power, with ICS in full automatic.
- A Water Addition is in progress due to an RCS leak.
- The data in the table below has been obtained from the Plant Computer.
- A step change in leakage is suspected at 0303 and rate was increased on the batch controller as a result.

Data Recording Time	0300	0303	0310
Pressurizer Level (Computer point C4017)	220 inches	220 inches	210 inches
Makeup Tank Level (Computer point A0498)	86 inches	84 inches	80 inches
RCS T_{ave} (Computer point A5066)	579.3˚F	579.2˚F	578.8˚F
Total Water Added to the Makeup Tank from 0300	N/A	60 gal	420 gal

Task Standard:	All critical tasks evaluated as SAT.
Required Materials:	OS-24, Conduct of Operations During Abnormal and Emergency Events, Rev 19
General References:	OS-24, Conduct of Operations During Abnormal and Emergency Events, Rev 19
Initiating Cue:	The CRS has directed you to perform a Transient RCS Leak Rate calculation that will most accurately determine current leak rate IAW OS-24, Attachment F.
Time Critical Task:	No
Validation Time:	10 minutes

SIMULATOR SETUP

Exam Setup: N/A

- N/A

- MALFUNCTIONS:

N/A

- OVERRIDES:

N/A

(Denote Critical Steps with a check mark)

START TIME: ____________

Evaluator's Cue: **Provide the operator with a copy of OS-24, Conduct of Operations During Abnormal and Emergency Events, Rev 19**

Procedure Note: **The longer the time interval between collecting data points, the more reliable the leakrate estimate will be. At a minimum leak rates should not be calculated for time intervals of < 5 minutes.**

√ **Performance Step: 1** Determine sets of data to use

Standard: Examinee determines that from 0300-0303 is less than 5 minutes and therefore not accurate.

Examinee determines that a step rise in leak rate occurred at 0303, and therefore going from 0300-0310 will not be the most accurate leak rate calculated.

Examinee determines that a larger leak rate is occurring in the 7 minute timeframe between 0303 and 0310, and uses those data points.

Comment:

√ **Performance Step: 2** Determine (ΔPL)*(12), where

ΔPL = change in Pressurizer Level (Computer Point C4017) (initial - final inches)

Standard: Examinee determines:

(ΔPL)*(12)

(220 – 210)*(12)

(10)*(12) = **120**

Comment:

√ **Performance Step: 3** Determine (ΔMTL)*(30), where

ΔMTL = change in Makeup Tank Level (Computer Point A0498) (initial – final inches)

Standard: Examinee determines:

(ΔMTL)*(30)

(84-80)*(30)

(4)*(30) = **120**

Comment:

√ **Performance Step: 4** Determine (ΔTavg)*(COEFF), where:

ΔTavg = change in RCS Average Temperature (Computer Point A5066) (initial - final °F)

COEFF = 95 gal/°F if Tavg is 579 °F

Standard: Examinee determines:

(ΔTavg)*(COEFF)

(579.2-578.8)*(95)

(.4)*(95) = **38**

Comment:

√ **Performance Step: 5** Determine GAL ADD, where:

GAL ADD = gallons added to the MU/RCS systems during the observation period,

Standard: 420-60 = **360**

Comment:

√ **Performance Step: 6** Determine ΔTIME, where:

ΔTIME = change in time (final – initial minutes)

Standard: (final – initial minutes)

0310 – 0303 = **7**

Comment:

√ **Performance Step: 7** Determine RCS leakrate (GPM) = [(ΔPL)*(12) + (ΔMTL)*(30) - (ΔTavg)*(COEFF) + GAL ADD] / ΔTIME

Standard: Examinee determines

[(ΔPL)*(12) + (ΔMTL)*(30) - (ΔTavg)*(COEFF) + GAL ADD] / ΔTIME

[120+ 120 - 38+ 360] / 7 = **80.0-80.3 GPM**

Evaluator's Note: **If the student incorrectly uses the data for 0300 and 0303, they will come up with 36.3 GPM**

If the student incorrectly uses the data for 0300 and 0310, they will come up with 67.2 GPM

Comment:

Terminating Cue: **After the Leak Rate is calculated: Evaluation on this JPM is complete.**

STOP TIME: ____________ **TIME CRITICAL STOP TIME:** N/A

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2012 TMI NRC JPM RO A1-2

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________________ Date: ____________________

INITIAL CONDITIONS:

- You are the URO
- The instructor/examiner will act as the CRS.
- The Reactor is at 100% power, with ICS in full automatic.
- A Water Addition is in progress due to an RCS leak.
- The data in the table below has been obtained from the Plant Computer.
- A step change in leakage is suspected at 0303 and rate was increased on the batch controller as a result.

Data Recording Time	0300	0303	0310
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Total Water Added to the Makeup Tank from 0300	N/A	60 gal	420 gal

INITIATING CUE: The CRS has directed you to perform a Transient RCS Leak Rate calculation that will most accurately determine current leak rate IAW OS-24, Attachment F.

Time Critical: No

Facility:	THREE MILE ISLAND UNIT 1	Task No.:	EQC00015
Task Title:	<u>Isolate a component for maintenance</u>	JPM No.:	<u>2012 NRC JPM RO A2</u>
K/A Reference:	G 2.2.41 (3.5/3.9)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

<u>Method of testing:</u>

Simulated Performance: ______ Actual Performance: __X__

Classroom __X__ Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:	You are the Extra RO. NR-P-1B has been shutdown due to an excessive packing leak. FIN Maintenance is prepared to repack NR-P-1B.
Task Standard:	Appropriate isolation points identified.
Required Materials:	
General References:	OP-MA-109-101, Clearance and Tagging.
Handout:	302-202, Nuclear Services River Water Systems Flow Diagram, Rev 77 302-203, Screen Wash and Sluice System Flow Diagram, Rev 69 1107-5, Electrical Distribution Component Listing, Rev 141 OP-MA-109-101 Attachment 23 Rev 12
Initiating Cue:	Determine the necessary isolation points for repacking of NR-P-1B, and document on the Worker Tagout Clearance Form.

Time Critical Task: No

Validation Time: 20 minutes

SIMULATOR SETUP

N/A

(Denote Critical Steps with a check mark)

START TIME: ____________

EVALUATOR NOTE: **Provide Candidate 302-202, 302-203 and 1107-5.**

Performance Step: 1 Obtains

302-202, Nuclear Services River Water Systems Flow Diagram.

302-203 Screen Wash and Sluice system Flow Diagram.

1107-5, Electrical Distribution Component Listing.

OP-MA-109-101, Attachment 23, Worker Tagout Clearance Form.

Standard: Materials obtained.

Comment:

Performance Step: 2 **Locates NR-P-1B Nuclear River Water Pump at coordinate A9 on 302-202 and at E8 on 302-203**

Standard: Pump located.

Comment:

√ **Performance Step: 3** **Candidate determines isolation points and lists on OP-TM-109-101 Attachment 23.**

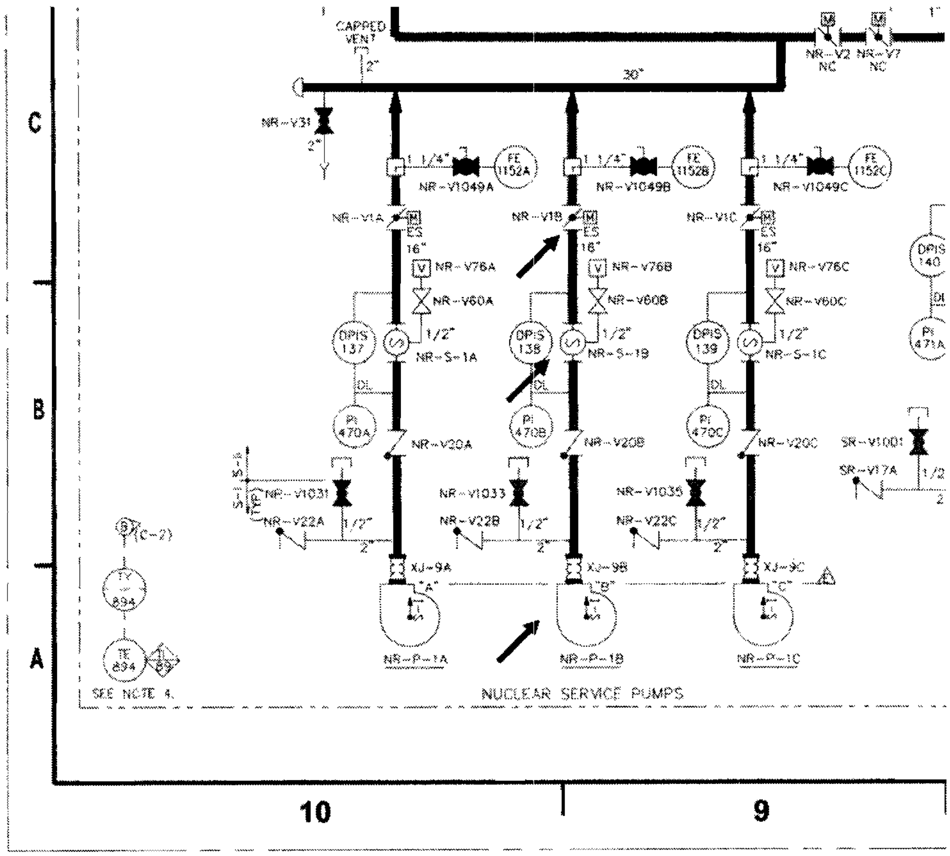
Standard:

- NR-P-1B Ext Control at (CC) info tagged in PTL
- NR-P-1B Ext Control at (CR) info tagged in PTL
- NR-V-1B Ext Control at (CR) info tagged Closed
- √ NR-P-1B Bkr at 1R 480v ES SWGR UNIT 3A Danger Tagged Racked out Locked
- (Lock will be tagged also)
- √ NR-P-1B Bkr at 1T 480v ES SWGR UNIT 3A Danger Tagged Racked out Locked
- (Lock will be tagged also)
- NR-S-1B-EX4 (strainer extension control) info Tagged Auto
- NR-V-53B-EX4 (AUTO/OFF/MAN) info Tagged in Manual
- NR-V-53B-EX5 (OPEN/CLOSE) info Tagged Closed
- √ NR-V-1B Bkr at 1C ES Valves Danger Tagged Off
- √ NR-S-1B Bkr at 1C ES Valves Danger Tagged Off
- √ NR-V-1B Handwheel Danger Tagged Closed
- √ WT-V-661 Lube Water Supply to NR-P-1B Danger Tagged Closed

Comment:

Terminating Cue: **When components and positions are identified on the Worker Tagout Form the JPM may be terminated.**

STOP TIME: ____________ **TIME CRITICAL STOP TIME:** N/A


CAPPED VENT
2"
30"
NR-V2 NC
NR-V7 NC
NR-V31
NR-V1049A
NR-V1049B
NR-V1049C
FE 1152A
FE 1152B
FE 1152C
NR-V1A
NR-V1B
NR-V1C
16"
NR-V76A
NR-V76B
NR-V76C
NR-V60A
NR-V60B
NR-V60C
DPIS 137
DPIS 138
DPIS 139
DPIS 140
NR-S-1A
NR-S-1B
NR-S-1C
PI 470A
PI 470B
PI 470C
PI 471A
NR-V20A
NR-V20B
NR-V20C
SR-V1001
SR-V17A
NR-V1031
NR-V1033
NR-V1035
NR-V22A
NR-V22B
NR-V22C
XJ-9A
XJ-9B
XJ-9C
NR-P-1A
NR-P-1B
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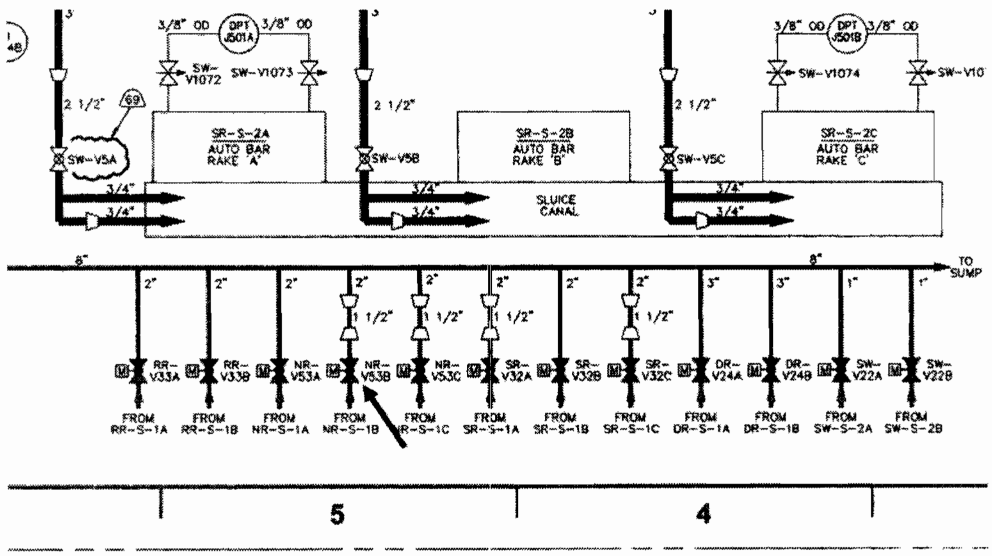
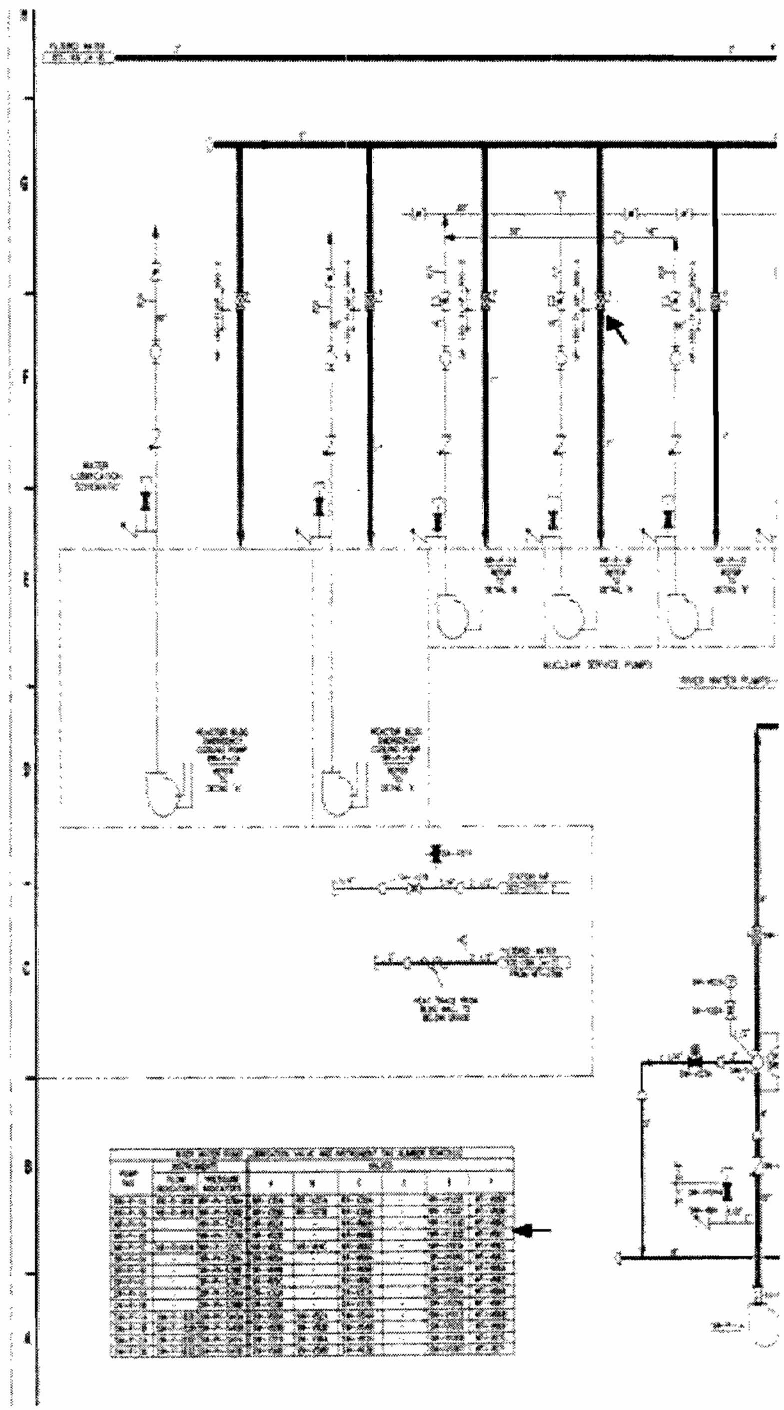
SEE NOTE 4.
NUCLEAR SERVICE PUMPS
C
B
A
10
9





VERIFICATION OF COMPLETION

Job Performance Measure No.: 2012 NRC JPM RO A2

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

You are the Extra RO.

NR-P-1B has been shutdown due to an excessive packing leak.

Maintenance is prepared to repack NR-P-1B.

INITIATING CUE:

Determine the necessary isolation points for repacking of NR-P-1B, and document on the worker Tagout Clearance Form.

Non-Plant Equipment Work: ☐

Plant Equipment Work: ☐
(Operations Authorization is required)

ATTACHMENT 23
Worker Tagout Clearance Form
Page 1 of 2

Worker Tagout Log # ________

Operations Authorization Required Prior to starting Worker Tagout: ☐

Unit: ______ System: ______ Equipment Tag: ________________ Description: ______________________________

Description of work: ____

Holder: __________________________ Extension: ________ Pager: ________

ISOLATION POINT EQ. TAG /EQUIPMENT NAME	TAG SEQ	TAG TYPE	TAG POSITION	TAG BY	IV CV	VERIF. BY	RTS SEQ	RTS POSITION	RTS BY	IV CV	VERIF. BY

SPECIAL INSTRUCTIONS: ____

____

COMMENTS (E.G. THROTTLED VALVE NOTES): ____

____

TAGOUT PREPARER: ____________________ DATE: ________ SUPERVISOR APPROVAL: ____________________ DATE: ________

OPERATIONS AUTHORIZATION (IF REQUIRED): ____________________ DATE: ________

2ND OPERATIONS AUTHORIZATION (IF REQUIRED): ____________________ DATE: ________

ATTACHMENT 23
Worker Tagout Clearance Form
Page 2 of 2

ISOLATION POINT EQ. TA G/ EQUIPMENT NAME	TAG SEQ	TAG TYPE	TAG POSITION	TAG BY	IV CV	VERIF. BY	RTS SEQ	RTS POSITION	RTS BY	IV CV	VERIF. BY

Note: Additional copies of this sheet may be used if additional isolation points are required.

48. NR (NUCLEAR SERVICES COOLING - RIVER WATER)

TAG NO.	VALVE OP	DESCRIPTION	CONTROL DRAWING	ELECTRICAL DISTRIBUTION	UNIT/ SW
NR-P-1A		NUCLEAR SERVICE COOLING RIVER WATER PUMP A	208-355	1R 480V	1R-2B
NR-P-1B		NUCLEAR SERVICE COOLING RIVER WATER PUMP B	208-356	1R 480V	1R-3A
			208-357	1T 480V	1T-3A
NR-P-1C		NUCLEAR SERVICE COOLING RIVER WATER PUMP C	208-358	1T 480V	1T-2B
NR-S-1A		NUC. SERV. PUMP A DISCHARGE STRAINER		1A SCRN HSE ES MCC	1BL
NR-S-1B		NUC. SERV. PUMP B DISCHARGE STRAINER		1C ES VAL. MCC	13AL
NR-S-1C		NUC. SERV. PUMP C DISCHARGE STRAINER		1B SCRN HSE ES MCC	1DL
NR-V-1A	MO	NUCLEAR SERVICES PUMP DISCHARGE	208-486	1A-ESSH CC	12B
NR-V-1B	MO	NUCLEAR SERVICES PUMP DISCHARGE	208-490	1C-ESV CC	2A
NR-V-1C	MO	NUCLEAR SERVICES PUMP DISCHARGE	208-486	1B-ESSH CC	1B
NR-V-2	MO	N.S. TO SECONDARY SEV. HDR.	208-446	1A-ESSH CC	2A
NR-V-3*	MO	N.S. PUMP HEADER OUTLET	208-447	1A-ESSH CC	2B
NR-V-4A	MO	DE-ICE MAKE-UP	208-482	1A-ESV CC	7C
NR-V-4B	MO	DE-ICE MAKE-UP	208-483	1B-ESV CC	7C
NR-V-5*	MO	N.S. SUPPLY	208-447	1A-ESV CC	8D
NR-V-6*	MO	NUC AND INTERMEDIATE/SEC. SERV. ISOL.	208-446	1B-ESV CC	10D
NR-V-7	MO	NUC/SEC DISCHARGE HDR ISO.	208-446	1B-ESSH CC	2A
NR-V-8A	MO	NS-HEAT EXCHANGER INLET	208-450	1A-ESV CC	9A
NR-V-8B	MO	NS HEAT EXCHANGER INLET	208-450	1A-ESV CC	9B
NR-V-8C	MO	NS HEAT EXCHANGER INLET	208-450	1B-ESV CC	9A
R-V-8D	MO	NS HEAT EXCHANGER INLET	208-450	1B-ESV CC	9B
NR-V-10A*	MO	INT. SERVICE R.W. H.E. INLET ISOL.	208-448	1A-ESV CC	9C
NR-V-10B*	MO	INT. SERVICE R.W. H.E. INLET ISOL.	208-448	1A-ESV CC	9D
NR-V-15A	MO	INT. SERVICE R.W. H.E. OUTLET ISOL.	208-449	1B-ESV CC	9C
NR-V-15B	MO	INT. SERVICE R.W. H.E. OUTLET ISOL.	208-449	1B-ESV CC	9D
NR-V-16A	MO	N.S. HEAT EXCHANGER OUTLET ISOLATION	208-451	1A-ESV CC	8A
NR-V-16B	MO	N.S. HEAT EXCHANGER OUTLET ISOLATION	208-451	1A-ESV CC	8B
NR-V-16C	MO	N.S. HEAT EXCHANGER OUTLET ISOLATION	208-451	1B-ESV CC	8A
NR-V-16D	MO	N.S. HEAT EXCHANGER OUTLET ISOLATION	208-451	1B-ESV CC	8B
NR-V-18	MO	N.S. SYSTEM OUTLET SHUTOFF	208-481	1C-ESV CC	7D
NR-V-19	MO	EMERG. DE-ICING	208-481	1C-ESV CC	5D
NR-V-53A	MO	NR-S-1A BACKWASH VALVE	B/M RH-138	1A-ESSH CC	1BL
NR-V-53B	MO	NR-S-1B BACKWASH VALVE	DWG 41-412	1C-ESV	13AL
NR-V-53C	MO	NR-S-1C BACKWASH VALVE	-143	1B-ESSH CC	1DL

*BKR's normally open at power for App. R concerns

Facility:	TMI Unit 1	Task No.:	OF0400005
Task Title:	Calculate Dose Limit Stay Times	JPM No.:	2012 NRC JPM RO A3
K/A Reference:	2.3.4 (3.2/3.7)		Modified from Bank JPM TMI 2011 CERT JPM RO A3

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- You are assigned to the OSC.
- The plant is in an Site Area Emergency.
- The reactor is tripped and ESAS is actuated.
- Re-positioning a manual valve located in a Locked High Radiation Area would help to mitigate the event.
- The specific radiation level in the Locked High Radiation Area is not known so the upper limit (15000 mrem/hr) is assumed.
- The Radiation Protection Manager has approved an increase to the maximum permissible limit for all OSC personnel.
- Re-positioning the manual valve is NOT considered to be an emergency action.
- Your annual accumulated TEDE dose for this year is 525 mrem.

Task Standard: All critical tasks evaluated as SAT.

Required Materials: Calculator

General References: RP-AA-460, CONTROLS FOR HIGH AND VERY HIGH RADIATION AREAS, Revision 21

EP-AA-112-100-F-01, SHIFT EMERGENCY DIRECTOR CHECKLIST Rev N

EP-AA-113, PERSONNEL PROTECTIVE ACTIONS Revision 10

Handout: RP-AA-460, CONTROLS FOR HIGH AND VERY HIGH RADIATION AREAS, Revision 21

EP-AA-113, PERSONNEL PROTECTIVE ACTIONS Revision 10

Perform in a location with the Emergency Plan and Radiation Protection procedures available.

Initiating Cue: Determine your maximum stay time, **in whole minutes**, for performing the valve operation without exceeding the limit approved by the (TSC) Radiation Protection Manager.

Assume that exposure stops when you exit the Locked High Radiation Area.

Time Critical Task: NO

Validation Time: 20 minutes

SIMULATOR SETUP

N/A

(Denote Critical Steps with a check mark)

START TIME: ____________

EP-AA-113 4.3.3

√ **Performance Step: 1** Determine the maximum increased exposure limit for OSC personnel.

Standard: ≤ 5 rem

Comment:

RP-AA-460, Step 2.10

Performance Step: 2 Determine the maximum radiation level in the Locked High Radiation Area

Standard: 15000 mrem from Initial Conditions

Comment:

√ **Performance Step: 3** Calculate maximum stay time.

Standard:

- 5 rem - .525 rem = 4.475 rem to the TEDE limit
- 4.475 rem/15 rem/hr x 60 mins/hr = 17.9 minutes
- Therefore 17 minutes (in whole minutes)

** Acceptable range is ≥17.0 but ≤17.9 minutes **

Comment:

Terminating Cue: **When the stay time calculation is complete: Evaluation on this JPM is complete.**

STOP TIME: ____________ **TIME CRITICAL STOP TIME:** N/A

VERIFICATION OF COMPLETION

Job Performance Measure No.: TMI 2012 NRC JPM RO A3

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- You are assigned to the OSC.
- The plant is in an Site Area Emergency.
- The reactor is tripped and ESAS is actuated.
- Re-positioning a manual valve located in a Locked High Radiation Area would help to mitigate the event.
- The specific radiation level in the Locked High Radiation Area is not known so the upper limit (15000 mrem/hr) is assumed.
- The Radiation Protection Manager has approved an increase to the maximum permissible limit for all OSC personnel.
- Re-positioning the manual valve is NOT considered to be an emergency action.
- Your annual accumulated TEDE dose for this year is 525 mrem.

INITIATING CUE:

Determine your maximum stay time, **in whole minutes**, for performing the valve operation without exceeding the limit approved by the (TSC) Radiation Protection Manager.

Assume that exposure stops when you exit the Locked High Radiation Area.

TIME CRITICAL: No

Facility:	Three Mile Island	Task No.:	AOP602001
Task Title:	PERFORM AND APPROVE A MANUAL POWER RANGE CALCULATION	JPM No.:	2012 NRC JPM SRO A1-1
K/A Reference:	2.1.37 4.3 / 4.6	New JPM for ILT 10-02 NRC Exam	

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- You are the Control Room Supervisor.
- The Reactor is at 100% power, with ICS in full automatic.
- The Plant Computer is unavailable and has been off-line for 25 hours.
- NI-7 is Out of Service.
- No maintenance or surveillance items are in progress.
- Core Thermal Power has been calculated to be 99.9% IAW 1103-16, HEAT BALANCE CALCULATIONS.
- Incore Imbalance has been calculated to be 3% IAW OP-TM-300-202, QUADRANT POWER TILT AND AXIAL POWER IMBALANCE USING THE OUT-OF-CORE DETECTOR SYSTEM.
- Recalibration of the NI's is not required.
- The following items are available for your use:
  - An Examinee Data Sheet containing the current NI power level and imbalance.
  - Calculator

Task Standard: All critical tasks evaluated as SAT.

Required Materials: 1302-1.1, Power Range Calibration, Rev 58B

General References: 1302-1.1, Power Range Calibration, Rev 58B

Initiating Cue: Manually check and approve Power Range calibration using hand calculations IAW 1302-1.1.

Time Critical Task: N/A

Validation Time: 15 minutes

SIMULATOR SETUP

Exam Setup: N/A

- N/A

- MALFUNCTIONS:

N/A

- OVERRIDES:

N/A

(Denote Critical Steps with a check mark)

START TIME: ____________

Evaluator's Cue: **Provide the operator with a copy of 1302-1.1, Power Range Calibration.**

1302-1.1 Step 8.1.1

Performance Step: 1 Prerequisite:
- Reactor Power > 15%
- A/B OTSG Blowdown is secured.

Standard: Examinee determines from initial conditions that power is >15% and that OTSG Blowdown is secured.

Comment:

Procedure Note: - If reperforming Section 8.2 because plant conditions are not consistent with those used to generate Data Sheet 1, then additional SDR need not be generated per 8.2.3.

- If reperforming Section 8.3 because plant conditions are not consistent with those used to generate Data Sheet 2, then additional SDR need not be generated per 8.3.7.

1302-1.1 Step 8.1.2

Performance Step: 2 Procedure
- Preferable method is by computer, Section 8.2. If computer is used, go to Section 8.2 and N/A Section 8.3.

- If computer is inoperable, go to Section 8.3 to perform hand calculations and N/A Section 8.2.

Standard: Examinee determines from the initial conditions that the computer is not available, N/A's section 8.2 and goes to Section 8.3.

Comment:

1302-1.1 Step 8.3.1 and 8.3.2

Performance Step: 3 Reviews Limits, Precautions, and Prerequisites.

Standard: Examinee determines that Limits, Precautions, and Prerequisites are met.

Comment:

Procedure Note: Steps 1 - 5 may be performed in any order.

1302-1.1 Step 8.3.3.(1)

Performance Step: 4 Calculate Core Thermal Power using 1103-16 and RECORD on Data Sheet 2.

Standard: Examinee determines Core Thermal Power to be 99.9% from the initial conditions and records the data on Data Sheet 2.

Comment:

1302-1.1 Step 8.3.3.(2)

Performance Step: 5 Calculate Incore Imbalance using OP-TM-300-202 or OP-TM-300-203 and RECORD on Data Sheet 2.

Standard: Examinee determines Imbalance to be 3% from the initial conditions and records the data on Data Sheet 2.

Comment:

Evaluator Cue: **When the examinee discusses the need to attach Data Sheets from 1103-16 and OP-TM-300-202, inform the examinee that another RO will do that IAW Step 8.3.3.(3)**

1302-1.1 Step 8.3.3.(4)

Performance Step: 6 Record console indications for out-of-core total power on Data Sheet 2.

Standard: Examinee determines power level from Examinee Data Sheet and records the information on Data Sheet 2.

Comment:

1302-1.1 Step 8.3.3.(5)

Performance Step: 7 **RECORD** console indications for out-of-core imbalance on Data Sheet 2.

Standard: Examinee determines Out-of-Core Detector Imbalance from Examinee Data Sheet and records the information on Data Sheet 2.

Comment:

1302-1.1 Step 8.3.3.(6).1

√ **Performance Step: 8** PERFORM calculations for Error Linear Power (ELP)

Standard: Examinee performs calculations for Error Linear Power (ELP)

√ ELP5 = P5-T
= 99.1-99.9
= -0.8

√ ELP6 = P6-T
= 97.8-99.9
= -2.1

Examinee recognizes improper data submitted by RO for ELP6.

ELP7 = P7-T
= N/A

√ ELP8 = P8-T
= 98.3-99.9
= -1.6

Comment:

1302-1.1 Step 8.3.3.(6).2

√ **Performance Step: 9** PERFORM calculations for Offset Error (OE)

Standard: Examinee performs calculations for Offset Error (OE)

√ OE5 = 100/T[I5-(Ix1.000)]

= 100/99.9[3-(3x1.000)]

= 1.00(3-3)

= 0

Examinee recognizes improper data submitted by RO for OE5.

√ OE6 = 100/T[I6-(Ix1.000)]

= 100/99.9[2.1-(3x1.000)]

= 1.00(2.1-3)

= -0.9

OE7 = 100/T[I7-(Ix1.000)]

= N/A

√ OE8 = 100/T[I8-(Ix1.000)]

= 100/99.9[2.7-(3x1.000)]

= 1.00(2.7-3)

= -0.3

Comment:

1302-1.1 Step 8.3.3.(6).3 and .4

√ **Performance Step: 10** Answer questions on Data Sheet 2.

Standard: Examinee answers NO to "ELP <2% for all channels" and YES to "O.S. Error <2.5% for all channels".

Examinee recognizes data improperly checked by RO due to error carried forward.

Comment:

Evaluator's Note: **If the examinee decides to follow guidance of WC-TM-430, state that WC-TM-430 has been completed.**

1302-1.1 Step 8.3.3.(7)

Performance Step: 11 If any answers to Data Sheet 2 questions are NO and reactor power is > 15%, follow guidance of WC-TM-430.

Standard: Examinee determines that No was answered and decides to follow guidance of WC-TM-430.

Comment:

1302-1.1 Step 8.3.3.(8)

√ **Performance Step: 12** Calculate linear amplifier correction factors per Data Sheet 2 for channels that failed, otherwise N/A.

Standard: Examinee calculates linear amplifier correction factor for NI-6.

√ LA1 Correction Factor

= [(Tx3.614) + (Ix1.000)] / [(P6x3.614) + I6]

= [(99.9x3.614) + (3x1.000)] / [(97.8x3.614) + 2.1]

= [361.038 + 3] / [353.449 + 2.1]

= 364.038 / 355.549

= 1.023

Examinee recognizes data improperly filled out by RO due to error carried forward.

√ LA2 Correction Factor

= [(Tx3.614) - (Ix1.000)] / [(P6x3.614) - I6]

= [(99.9x3.614) - (3x1.000)] / [(97.8x3.614) - 2.1]

= [361.038 - 3] / [353.449 - 2.1]

= 358.038 / 351.349

= 1.019

Examinee recognizes data improperly filled out by RO due to error carried forward.

Comment:

Evaluator's Note: **If the examinee decides that I&C must be contacted for an adjustment, state that I&C have been contacted and will begin shortly.**

1302-1.1 Step 8.3.3.(9)

Performance Step: 13 **If** required, have I&C adjust power range linear amplifier per Section 8.4, except as noted below or in accordance with Step 8.4.1.11. N/A if **no** adjustments needed.

_____ a. **If** below 40% full power and/or during transient imbalance conditions, avoid adjustment of NI's solely for incore imbalance. **NOTIFY** Reactor Engineering if the offset limit is exceeded, otherwise N/A.

_____ b. **If** plant stability does **not** permit calibration to within ± 1% of computer read-out, and reactor power is ≥ 90%, **VERIFY** Error Linear Power is within ± 2%, otherwise N/A.

_____ c. **If** reactor power is < 90%, **VERIFY** Error Linear Power is within +4%, -2%, otherwise N/A.

Standard: Examinee determines the step is valid and that I&C must be contacted for an adjustment.

Comment:

1302-1.1 Step 8.3.3.(10)

√ **Performance Step: 14** NOTIFY Control Room Supervisor of power range calibration check results and that it is complete.

Standard: Examinee is the CRS and does NOT approve the calculation due to errors.

Comment:

Terminating Cue: **After DATA Sheet 2 is filled out completely and the decision to approve it or not has been made: Evaluation on this JPM is complete.**

STOP TIME: ____________ **TIME CRITICAL STOP TIME:** N/A

JPM CUE SHEET

Job Performance Measure No.: 2012 TMI NRC JPM SRO A1-1

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ____________________ Date: ____________

ANSWER KEY – DO *NOT* HAND TO STUDENT

	TMI - Unit 1 Surveillance Procedure	Number 1302-1.1
Title Power Range Calibration		Revision No. 58

DATA SHEET 2 Page 1 of 3

Hand Calculated Values

> **NOTE**
> If any NI is OOS, N/A the data and calculation for that NI.

ANSWER KEY – DO *NOT* HAND TO STUDENT

8.3.1/8.4.17(1) Core Thermal Power (T) from 1103-16 (%):

T = 99.9 %

8.3.2/8.4.17(2) Incore Imbalance (I) from OP-TM-300-202 or OP-TM-300-203 (%):

I = 3.0 %

8.3.4 Out-of-core total power (P) from console indicators (%):

P5 = 99.1 % (NI5)

P6 = 97.8 % (NI6)

P7 = N/A % (NI7)

P8 = 98.3 % (NI8)

8.3.5 Out-of-core imbalance (I) from console indicators (%):

I5 = +3.0 % (NI5)

I6 = +2.1 % (NI6)

I7 = N/A % (NI7)

I8 = +2.7 % (NI8)

8.3.6/8.4.17(4) 1. Error Linear Power (ELP) (%):

ELP5 = P5 - T = -0.8 %

ELP6 = P6 - T = -2.1 %

ELP7 = P7 - T = N/A %

ELP8 = P8 - T = -1.6 %

ANSWER KEY – DO *NOT* HAND TO STUDENT

ANSWER KEY – DO *NOT* HAND TO STUDENT

ANSWER KEY – DO *NOT* HAND TO STUDENT

	TMI - Unit 1 Surveillance Procedure	Number 1302-1.1
Title Power Range Calibration		Revision No. 58B

DATA SHEET 2 — Page 2 of 3

8.3.6/8.4.17(4) Offset Error (OE) (%):

$OE5 = \frac{100}{T}[I5 - (I \times 1.000)] =$ 0 %

$OE6 = \frac{100}{T}[I6 - (I \times 1.000)] =$ -0.9 %

$OE7 = \frac{100}{T}[I7 - (I \times 1.000)] =$ N/A %

$OE8 = \frac{100}{T}[I8 - (I \times 1.000)] =$ -0.3 %

3. Is absolute value of ELP ≤ 2% for all channels? ____ YES X NO

4. Is absolute value of O.S. Error ≤ 2.5% for all channels? X YES ____ NO

8.3.7 Linear Amplifier Correction Factors.

1. NI5:

LA1 Correction Factor = $\frac{[(T \times 3.451) + (I \times 1.000)]}{[(P5 \times 3.451) + I5]}$ = ______

LA2 Correction Factor = $\frac{[(T \times 3.451) - (I \times 1.000)]}{[(P5 \times 3.451) - I5]}$ = ______

2. NI6:

LA1 Correction Factor = $\frac{[(T \times \cancel{3.542}\ 3.614) + (I \times 1.000)]}{[(P6 \times \cancel{3.542}\ 3.614) + I6]}$ = 1.023

LA2 Correction Factor = $\frac{[(T \times \cancel{3.542}\ 3.614) - (I \times 1.000)]}{[(P6 \times \cancel{3.542}\ 3.614) - I6]}$ = 1.019

3. NI7:

LA1 Correction Factor = $\frac{[(T \times \cancel{3.871}\ 3.974) + (I \times 1.000)]}{[(P7 \times \cancel{3.871}\ 3.974) + I7]}$ = ______

LA2 Correction Factor = $\frac{[(T \times \cancel{3.871}\ 3.974) - (I \times 1.000)]}{[(P7 \times \cancel{3.871}\ 3.974) - I7]}$ = ______

ANSWER KEY – DO NOT HAND TO STUDENT
ANSWER KEY – DO NOT HAND TO STUDENT
ANSWER KEY – DO NOT HAND TO STUDENT

ANSWER KEY – DO *NOT* HAND TO STUDENT

	TMI - Unit 1 Surveillance Procedure	Number 1302-1.1
Title Power Range Calibration		Revision No. 58

DATA SHEET 2 Page 3 of 3

6.3.7 (cont'd)

4. NIS:

LA1 Correction Factor = $\frac{[(T \times 3.757) + (I \times 1.000)]}{[(PB \times 3.757) + IB]}$ = __________

LA2 Correction Factor = $\frac{[(T \times 3.757) - (I \times 1.000)]}{[(PB \times 3.757) - IB]}$ = __________

Performed by: ______________________ DATE: __________

Independent Verification of Calculations: ______________________ DATE: __________

Approved by: ______________________ DATE: __________

ANSWER KEY – DO NOT HAND TO STUDENT

ANSWER KEY – DO NOT HAND TO STUDENT

ANSWER KEY – DO *NOT* HAND TO STUDENT

INITIAL CONDITIONS:

- You are the Control Room Supervisor.
- The Reactor is at 100% power, with ICS in full automatic.
- The Plant Computer is unavailable and has been off-line for 25 hours.
- NI-7 is Out of Service.
- No maintenance or surveillance items are in progress.
- Core Thermal Power has been calculated to be 99.9% IAW 1103-16, HEAT BALANCE CALCULATIONS.
- Incore Imbalance has been calculated to be 3% IAW OP-TM-300-202, QUADRANT POWER TILT AND AXIAL POWER IMBALANCE USING THE OUT-OF-CORE DETECTOR SYSTEM.
- Recalibration of the NI's is not required.
- The following items are available for your use:
  - An Examinee Data Sheet containing the current NI power level and imbalance.
  - Calculator

INITIATING CUE: Manually check and approve Power Range calibration using hand calculations IAW 1302-1.1.

Time Critical: No

EXAMINEE DATA SHEET

Data obtained on: Date: Today   Time: t - 30 mins.

PRESENT OUT-OF-CORE POWER (CC)

NI-5 Core Power	99.1%
NI-6 Core Power	97.8%
NI-7 Core Power	OOS
NI-8 Core Power	98.3%

PRESENT OUT-OF-CORE IMBALANCE (CC)

NI-5 Imbalance	+3.0%
NI-6 Imbalance	+2.1%
NI-7 Imbalance	OOS
NI-8 Imbalance	+2.7%

	TMI - Unit 1 Surveillance Procedure	Number 1302-1.1
Title **Power Range Calibration**		Revision No. 58

DATA SHEET 2 Page 1 of 3

Hand Calculated Values

> **NOTE**
> If any NI is OOS, N/A the data and calculation for that NI.

8.3.1/8.4.17(1) Core Thermal Power (T) from 1103-16 (%):

T = 99.9 %

8.3.2/8.4.17(2) Incore Imbalance (I) from OP-TM-300-202 or OP-TM-300-203 (%):

I = 3.0 %

8.3.4 Out-of-core total power (P) from console indicators (%):

P5 = 99.1 % (NI5)

P6 = 97.8 % (NI6)

P7 = N/A % (NI7)

P8 = 98.3 % (NI8)

8.3.5 Out-of-core imbalance (I) from console indicators (%):

I5 = +3.0 % (NI5)

I6 = +2.1 % (NI6)

I7 = N/A % (NI7)

I8 = +2.7 % (NI8)

8.3.6/8.4.17(4) 1. Error Linear Power (ELP) (%):

ELP5 = P5 - T = -0.8 %

ELP6 = P6 - T = -1.2 %

ELP7 = P7 - T = N/A %

ELP8 = P8 - T = -1.6 %

	TMI - Unit 1 Surveillance Procedure	Number 1302-1.1
Title **Power Range Calibration**		Revision No. 58B

DATA SHEET 2 Page 2 of 3

8.3.6/8.4.17(4) Offset Error (OE) (%):

$OE5 = \frac{100}{T}[I5 - (I \times 1.000)] =$ +3.0 %

$OE6 = \frac{100}{T}[I6 - (I \times 1.000)] =$ -0.9 %

$OE7 = \frac{100}{T}[I7 - (I \times 1.000)] =$ N/A %

$OE8 = \frac{100}{T}[I8 - (I \times 1.000)] =$ -0.3 %

3. Is absolute value of ELP ≤ 2% for all channels? X YES ____ NO

4. Is absolute value of O.S. Error ≤ 2.5% for all channels? ____ YES X NO

8.3.7 Linear Amplifier Correction Factors.

1. NI5:

LA1 Correction Factor = $\frac{[(T \times 3.451) + (I \times 1.000)]}{[(P5 \times 3.451) + I5]}$ = 1.019

LA2 Correction Factor = $\frac{[(T \times 3.451) - (I \times 1.000)]}{[(P5 \times 3.451) - I5]}$ = 1.001

2. NI6:

LA1 Correction Factor = $\frac{[(T \times \cancel{3.542}^{3.614}) + (I \times 1.000)]}{[(P6 \times \cancel{3.542}_{3.614}) + I6]}$ = ____

LA2 Correction Factor = $\frac{[(T \times \cancel{3.542}^{3.614}) - (I \times 1.000)]}{[(P6 \times \cancel{3.542}_{3.614}) - I6]}$ = ____

3. NI7:

LA1 Correction Factor = $\frac{[(T \times \cancel{3.671}^{3.974}) + (I \times 1.000)]}{[(P7 \times \cancel{3.671}_{3.974}) + I7]}$ = ____

LA2 Correction Factor = $\frac{[(T \times \cancel{3.671}^{3.974}) - (I \times 1.000)]}{[(P7 \times \cancel{3.671}_{3.974}) - I7]}$ = ____

	TMI - Unit 1 Surveillance Procedure	Number 1302-1.1
Title Power Range Calibration		Revision No. 58

DATA SHEET 2 Page 3 of 3

8.3.7 (cont'd)

4. NI8:

LA1 Correction Factor = $\frac{[(T \times 3.757) + (I \times 1.000)]}{[(P8 \times 3.757) + I8]}$ = ________

LA2 Correction Factor = $\frac{[(T \times 3.757) - (I \times 1.000)]}{[(P8 \times 3.757) - I8]}$ = ________

Performed by: Rich Megill DATE: Today

Independent Verification of Calculations: Greg Hoek DATE: Today

Approved by: ________ DATE: ________

Facility:	Three Mile Island	Task No.:	22001027
Task Title:	PERFORM A TRANSIENT LEAK RATE CALCULATION WITH A T.S. CALL	JPM No.:	2012 NRC JPM SRO A1-2
K/A Reference:	2.1.23 4.3 / 4.4	Modified from Bank JPM TQ-TM-104-ADM-OS24-J100	

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- You are the CRS
- The Reactor is at 100% power, with ICS in full automatic.
- A Water Addition is in progress due to an identified RCS leak.
- The data in the table below has been obtained from the Plant Computer.
- A step change in leakage from the identified source is suspected at 0303 and rate was increased on the batch controller as a result.

Data Recording Time	0300	0303	0310
Pressurizer Level (Computer point C4017)	220 inches	219 inches	218 inches
Makeup Tank Level (Computer point A0498)	86 inches	86 inches	85 inches
RCS T_{ave} (Computer point A5066)	579.3˚F	579.1˚F	578.5˚F
Total Water Added to the Makeup Tank from 0300.	N/A	20 gal	120 gal

Task Standard: All critical tasks evaluated as SAT.

Required Materials:	OS-24, Conduct of Operations During Abnormal and Emergency Events, Rev 19
General References:	OS-24, Conduct of Operations During Abnormal and Emergency Events, Rev 19 Tech Specs
Initiating Cue:	Perform a Transient RCS Leak Rate calculation that will most accurately determine current leak rate IAW OS-24, Attachment F and identify any Tech Specs, if applicable.
Time Critical Task:	N/A
Validation Time:	10 minutes

SIMULATOR SETUP

Exam Setup: N/A

- N/A

- MALFUNCTIONS:

N/A

- OVERRIDES:

N/A

(Denote Critical Steps with a check mark)

START TIME: ____________

Evaluator's Cue: **Provide the operator with a copy of OS-24, Conduct of Operations During Abnormal and Emergency Events, Rev 19**

Procedure Note: **The longer the time interval between collecting data points, the more reliable the leakrate estimate will be. At a minimum leak rates should not be calculated for time intervals of < 5 minutes.**

√ **Performance Step: 1** Determine sets of data to use

Standard: Examinee determines that from 0300-0303 is less than 5 minutes and therefore not accurate.

Examinee determines that a step rise in leak rate occurred at 0303, and therefore going from 0300-0310 will not be the most accurate leak rate calculated.

Examinee determines that a larger leak rate is occurring in the 7 minute timeframe between 0303 and 0310, and uses those data points.

Comment:

√ **Performance Step: 2** Determine (ΔPL)*(12), where

ΔPL = change in Pressurizer Level (Computer Point C4017) (initial - final inches)

Standard: Examinee determines:

(ΔPL)*(12)

(219 – 218)*(12)

(1)*(12) = **12**

Comment:

√ **Performance Step: 3** Determine (ΔMTL)*(30), where

ΔMTL = change in Makeup Tank Level (Computer Point A0498) (initial – final inches)

Standard: Examinee determines:

(ΔMTL)*(30)

(86-85)*(30)

(1)*(30) = **30**

Comment:

√ **Performance Step: 4** Determine (ΔTavg)*(COEFF), where:

ΔTavg = change in RCS Average Temperature (Computer Point A5066) (initial - final °F)

COEFF = 95 gal/°F if Tavg is 579 °F

Standard: Examinee determines:

(ΔTavg)*(COEFF)

(579.1-578.5)*(95)

(.6)*(95) = **57**

Comment:

√ **Performance Step: 5** Determine GAL ADD, where:

GAL ADD = gallons added to the MU/RCS systems during the observation period,

Standard: 120-20 = **100**

Comment:

√ **Performance Step: 6** Determine ΔTIME, where:

ΔTIME = change in time (final – initial minutes)

Standard: (final – initial minutes)

0310 – 0303 = **7**

Comment:

√ **Performance Step: 7** Determine RCS leakrate (GPM) = [(ΔPL)*(12) + (ΔMTL)*(30) - (ΔTavg)*(COEFF) + GAL ADD] / ΔTIME

Standard: Examinee determines

[(ΔPL)*(12) + (ΔMTL)*(30) - (ΔTavg)*(COEFF) + GAL ADD] / ΔTIME

[12+ 30 - 57+ 100] / 7 = **12.1 GPM**

Evaluator's Note: **If the student incorrectly uses the data for 0300 and 0303, they will come up with 4.3 GPM**

If the student incorrectly uses the data for 0300 and 0310, they will come up with 9.8 GPM

Comment:

√ **Performance Step: 8** Determine Tech Spec Applicability

Standard: Examinee determines Tech Spec 3.1.6.1 applies:

3.1.6.1 If the total reactor coolant leakage rate exceeds 10 gpm, the reactor shall be placed in hot shutdown within 24 hours of detection.

Examinee recommends placing the reactor in Hot Shutdown within 24 Hours.

Comment:

Terminating Cue: **After the Leak Rate is calculated and a Tech Spec call is considered: Evaluation on this JPM is complete.**

STOP TIME: ____________ **TIME CRITICAL STOP TIME:** N/A

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2012 TMI NRC JPM SRO A1-2

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ____________________ Date: ____________

INITIAL CONDITIONS:

- You are the CRS
- The Reactor is at 100% power, with ICS in full automatic.
- A Water Addition is in progress due to an identified RCS leak.
- The data in the table below has been obtained from the Plant Computer.
- A step change in leakage from the identified source is suspected at 0303 and rate was increased on the batch controller as a result.

Data Recording Time	0300	0303	0310
Pressurizer Level (Computer point C4017)	220 inches	219 inches	218 inches
Makeup Tank Level (Computer point A0498)	86 inches	86 inches	85 inches
RCS T_{ave} (Computer point A5066)	579.3˚F	579.1˚F	578.5˚F
Total Water Added to the Makeup Tank from 0300.	N/A	20 gal	120 gal

INITIATING CUE: Perform a Transient RCS Leak Rate calculation that will most accurately determine current leak rate IAW OS-24, Attachment F and identify any Tech Specs, if applicable.

Time Critical: No

Transient RCS Leakrate Calculation Methodology

a. This method should **not** be relied upon for leakrate determinations at < 5 GPM. The uncertainty in the result will vary greatly based on the stability of RCS conditions.

b. The longer the time interval between collecting data points, the more reliable the leakrate estimate will be. At a minimum leak rates should not be calculated for time intervals of < 5 minutes.

c. In order to collect data points at the same time, the required plant parameters should be put on the same computer group so they can be printed out and then used in the calculation.

RCS leakrate (GPM) =
[(ΔPL)*(12) + (ΔMTL)*(30) - (ΔTavg)*(COEFF) + GAL ADD] / ΔTIME

ΔPL = change in Pressurizer Level (Computer Point C4017) (initial - final inches)
ΔMTL = change in Makeup Tank Level (Computer Point A0498) (initial – final inches)
ΔTavg = change in RCS Average Temperature (Computer Point A5066) (initial - final °F)
GAL ADD = gallons added to the MU/RCS systems during the observation period
ΔTIME = change in time (final – initial minutes)
COEFF = 95 gal/°F if Tavg is 579 °F otherwise use the table below

Average RCS temperature over period of evaluation	COEFF (GAL/°F)
579	95
555	90
532	84
510	78
485	72
450	66
385	54
350	48
305	42
270	38

Facility:	TMI Unit 1	Task No.:	EQC02005
Task Title:	Evaluate a Completed Surveillance Procedure and Perform Appropriate Actions	JPM No.:	2012 NRC JPM SRO A2
K/A Reference:	2.2.12 (4.1)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- You are the Shift Manager.
- The instructor/examiner will act as all other personnel.
- A reactor startup is commencing, currently in the Prerequisites of 1102-2, Plant Startup, expected to go critical within your shift.
- The reactor is more than 1% shutdown with RCS temperature at 526°F.
- All test equipment was proven reliable.

Task Standard: All critical steps evaluated as SAT.

Required Materials: ER-TM-321-1041, TMI-1 IST Program Requirements, Rev 0.

General References:

- OP-TM-533-202, IST OF DR-P-1B AND VALVES, Rev. 12
- ER-TM-321-1041, TMI-1 IST Program Requirements, Rev. 0
- Technical Specifications

Handouts: A completed OP-TM-533-202 with DR-V-1B stroke time in the "Evaluation Region", DR-P-1B vibration reading in the "Required Action" range.

Initiating Cue: Review the completed IST IAW OP-TM-533-202, IST of DR-P-1B and Valves, Section 5.0.

Time Critical Task: N/A

Validation Time: 15 minutes.

SIMULATOR SETUP

N/A

(Denote Critical Steps with a check mark)

START TIME: ____________

Evaluator Cue: **Provide completed OP-TM-533-202 and data package.**

Evaluator Note: **OP-TM-533-202, Step 5.1 states to Ensure Attachment 7.1 is completed, Performance Step 1 starts with Attachment 7.1.**

OP-TM-533-202, Attachment 7.1, Step 1

Performance Step: 1 DR-P-1B Pump ΔP and Vibration measurements were within the allowable range from the attached IST Database sheets. (Required for T.S. 4.2.2.) (Column vibration readings not required for T.S. 4.2.2.)

Standard:

- Candidate verifies that DR-P-1B Mtr Upper Bearing Vib, N-S (IPS) (AV) is in the "Alert" range, and refers to ER-TM-321-1041, TMI-1 IST PROGRAM REQUIREMENTS.

Comment:

Evaluator Note: **ER-TM-321-1041, Steps 4.4.3(c)1-7 are N/A**

Evaluator Cue: **If contacted as Work Management, acknowledge any direction given.**

ER-TM-321-1041, Step 4.4.3(c).8

√ **Performance Step: 2** Work Management shall take action from the IR to double the testing frequency of the pump.

- Increased pump testing frequency (double base test frequency) shall be in effect until the pump is no longer in the Alert range as determined by the successful performance of the IST surveillance and identification and correction of the cause.

Standard: Candidate either states that they will initate an IR or informs Work Management to initiate an IR to double the testing frequency of DR-P-1B.

Comment:

OP-TM-533-202, Attachment 7.1, Step 2

√ **Performance Step: 3** Open stroke times of DR-V-1B was within the Allowable Range from attached IST Database sheets. (Required for T.S. 4.2.2.)

Standard:

- Candidate verifies that the stroke time for DR-V-1B is in "Inoperable Region" range and refers to ER-TM-321-1041, TMI-1 IST PROGRAM REQUIREMENTS.

Comment:

ER-TM-321-1041, Step 4.5.2.D.(a)

Performance Step: 4 Shift Management shall declare the valve inoperable.

Standard:

- Candidate declares DR-V-1B inoperable.

Comment:

Evaluator Note:

Possible distractor Tech Spec Calls:

1) The candidate may declare a 72 Hour Tech Spec:

3.3.2 Maintenance or testing shall be allowed <u>during reactor operation on</u> any component(s) in the makeup and purification, decay heat, RB emergency cooling water, RB spray, BWST level instrumentation, or cooling water systems which will not remove more than one train of each system from service. Components shall not be removed from service so that the affected system train is inoperable for more than 72 consecutive hours. If the system is not restored to meet the requirements of Specification 3.3.1 within 72 hours, the reactor shall be placed in a HOT SHUTDOWN condition within six hours.

This is not applicable, however, due to the reactor being in a Hot Shutdown condition.

2) The candidate may declare no Tech Spec clock is applicable due to the component being a valve and not a pump. However, the basis for 3.3.1 states that the respective cooling water system components are included.

Evaluator Note: **Correct Tech Spec path:**

1) 3.3.1.1.d: The reactor shall not be made critical unless the following conditions are met: Two decay heat removal coolers and their cooling water supplies are OPERABLE. (See Specification 3.3.1.4) Specification 3.0.1 applies.

3.3.1. Basis: The requirements of Specification 3.3.1 assure that, before the reactor can be made critical, adequate engineered safety features are operable. Two engineered safeguards makeup pumps, two decay heat removal pumps and two decay heat removal coolers (along with their respective cooling water systems components) are specified.

ER-TM-321-1041, Step 4.5.2.D.(b)

√ **Performance Step: 5** Shift Management shall initiate the Technical Specification time clock if applicable.

Standard:

- Candidate determines that the reactor cannot be made critical based on the requirements of Tech Spec 3.3.1.1.d.

Comment:

Evaluator Cue: **ER-TM-321-1041, Steps 4.5.2.D, steps (c)-(f) are not scripted. However, if discussion includes an Issue Report, state that the STA will initiate the IR.**

Evaluator Note: **ER-TM-321-1041, Steps 4.5.2.D, steps (c)-(f) are not scripted. However, if discussion includes an Issue Report, state that the STA will initiate the IR.**

Evaluator Note: **OP-TM-533-202, Attachment 7.1, Steps 3-8 are all in the acceptable range.**

OP-TM-533-202, Attachment 7.1

√ **Performance Step: 6**

◊ Test Acceptance Criteria satisfied.
◊ Test Acceptance Criteria not satisfied.
Discrepancy and Action Taken:____________

SRO review of completed procedure and evaluation of Acceptance Criteria:
Signature: _________ Date: __________ Time: ________

Standard:

- Candidate determines that Test Acceptance Criteria is NOT satisfied and checks the appropriate box, lists the discrepancies and actions taken, then signs, dates, and times Attachment 7.1

Comment:

Terminating Cue: When Attachment 7.1 has been signed: Evaluation on this JPM is complete.

STOP TIME: ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2012 NRC JPM SRO A2

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ____________________ Date: ____________

Initial Conditions:

- You are the Shift Manager.
- The instructor/examiner will act as all other personnel.
- A reactor startup is commencing, currently in the Prerequisites of 1102-2, Plant Startup, expected to go critical within your shift.
- The reactor is more than 1% shutdown with RCS temperature at 526°F.
- All test equipment was proven reliable.

INITIATING CUE: Review the completed IST IAW OP-TM-533-202, IST of DR-P-1B and Valves, Section 5.0.

TIME CRITICAL: No

DR-P-1B	last performance	-50%	plus 50 %
ah	0.04003	0.020015	0.060045
av	0.03428	0.01714	0.05142
aa	0.05413	0.027065	0.081195
clh	0.1704	0.0852	0.02556
clv	0.1349	0.06745	0.020235

FOR TRAINING ONLY

OP-TM-533-202 / -204

Database Revision:
2004.0

Under the Following Conditions ONLY: Normal Quarterly

River Water Level Measured Value: 13.376 psi ~~feet~~ Reference 17.3 psi ~~feet~~

Instrument: SR-LI-1791

Discharge Pressure Measured Value: 26.5 psi Reference 26 psi

Instrument: DR-PI-472B

DR-P-1B **Delta Pressure (DP):**

Required Action Range If Above this Value:	40.685	psid	*Inoperable Region*
Highest Measured Value and Still Acceptable:	40.685	psid	
Calculated Value: 39.876 psid	39.5	psid Reference	Normal Region
Lowest Measured Value and Still Acceptable:	37.525	psid	
Alert Range if Below this Value:	37.525	psid	*Double Frequency Region*
Lowest Value and Still in Alert Range:	36.735	psid	
Required Action Range If Below this Value:	36.735	psid	*Inoperable Region*

DP = ((311' - River Elevation) x 0.433) + Discharge Pressure

DP = ((311 - __________) x 0.433) + ____________

(17.3 psi - 3.924) + 13.376 + 26.5 = 39.876

FOR TRAINING ONLY

)P-TM-533-202 / -20

ata Sheet: Attachment 7.2

DR-P-1B

Flow Rate: **Measured Value:** 6500 gpm

Instrument: DR-DPI-1303B

Reference: 6500 gpm

DR-V-3A(B) Position w/ flow at 6500 gpm: **Measured Value:** 55 degrees

Discharge Pressure with DR-V-3A(B) and DR-V-24A(B) Open: **Measured Value:** 23.5 psi

Instrument: DR-PI-472B | Acceptable if >= 20 psig

DR-S-1A(B) DP: **Measured Value:** 3.4 psid

Instrument: DR-DPIS-144 | Acceptable if < 6 psid

DC-C-2A(B) DP: **Measured Value:** 7.0 psid

Instrument: DR-PI-120/121 | Acceptable if < 11 psid

ow Rate w/ DR-V-3A(B) Fully Open: **Measured Value:** 7048 gpm

Instrument: DR-DPI-1303B

Notes:

Do not change dp acceptable value to less than 36.6 psid in accordance with C-1101-533-E410-013. *The design basis minimum DR Pump dp is related to* ensuring a system flow rate of 6000 gpm at river water level 275 feet. The DR system hydraulic calculation C-1101-533-E410-013 provides in part the basis for system operability, as 6000 gpm can be achieved. This 6000 gpm requirement is obtained when DR-S-1A/B and DC-C-2A/B are at design fouled conditions and a river elevation of 275 feet including a penalty for instrument error.

FOR TRAINING ONLY

Decay River

OP-TM-533-202 / -204

Database Revision: 2004.0

Under the Following Conditions ONLY: Normal Quarterly

Vibration:

DR-P-1B **Motor Upper Bearing: Horizontal- EW (AH)**

Required Action Range If Above this Value:	0.215	ips	***Inoperable Region***
Alert Range If Above this Value:	0.089	ips	***Double Frequency Region***
Highest Measured Value and Still Acceptable:	0.089	ips	Normal Region
Lowest Measured Value and Still Acceptable:	0	ips	
Measured Value: 0.088 ips	0.036	ips	Reference

DR-P-1B **Motor Upper Bearing: Horizontal - NS (AV) (Substitutes for Vertical)**

Required Action Range If Above this Value:	0.150	ips	***Inoperable Region***
Alert Range If Above this Value:	0.062	ips	***Double Frequency Region***
Highest Measured Value and Still Acceptable:	0.062	ips	Normal Region
Lowest Measured Value and Still Acceptable:	0	ips	
Measured Value: 0.148 ips	0.025	ips	Reference

FOR TRAINING ONLY

OP-TM-533-202 / -204

DR-P-1B **Motor Upper Bearing: Axial (AA)**

Required Action Range If Above this Value:	0.384	ips	*Inoperable Region*
Alert Range If Above this Value:	0.160	ips	*Double Frequency Region*
Highest Measured Value and Still Acceptable:	0.160	ips	Normal Region
Lowest Measured Value and Still Acceptable:	0	ips	

Measured Value: 0.155 ips 0.064 ips Reference

FOR TRAINING ONLY

DR-V-1B OP-TM-533-202 Data Sheet

DECAY HEAT RIVER WATER Valves-Open-R

DR-P1B DISCHARGE VALVE

Open Stroke

Database Revision: 2004.0

Design Basis Stroke Time (Stroke Time Required to Ensure Valve Safety Function can be met): Not Applicable seconds

Inoperable Region

Inoperable if Above this Stroke Time (Max Stroke): 182.5 seconds

Evaluation Region

Longest Stroke Time that is still Acceptable: 167.9 seconds

Measured Value: 183.8

146 seconds

Reference Stroke Time:

Acceptable Operation Region

Shortest Stroke Time that is still Acceptable: 124.1 seconds

Evaluation Region

Notes: Evaluation Region: stroke time region that does NOT make the valve inoperable but requires the valve to undergo evaluation.

Inoperable Region: The valve has exceeded its Limiting Stroke Time and is inoperable.

A valve that does not stroke is immediately inoperable.

FOR TRAINING ONLY

IST Generic Requirements

Revision: 2004.0

Yes / N/A — AR / IRs have been submitted for degraded conditions discovered, but not covered by this procedure.

Yes / N/A — All burned out light bulbs discovered during surveillance have been replaced or AR / IR submitted if condition is not the bulb.

FOR TRAINING ONLY

Facility:	TMI Unit 1	Task No.:	23101001
Task Title:	Review and Approve a Gaseous Release Permit for a Waste Gas Tank	JPM No.:	2012 NRC JPM SRO A3
K/A Reference:	2.3.6 (2.0/3.8)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom X Simulator ______ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- You are the Shift Manager.
- The instructor/examiner will act as all other personnel.
- The plant is at 100% power.
- A Gaseous Release Permit was started for the "A" Waste Gas Tank.
- The "A" Waste Gas Tank was isolated 4.5 days ago and no valve manipulations have occurred since isolation.
- The "A" Waste Gas Tank Pressure is 80 psig.
- This is a routine release; no emergency or concern exists.

Task Standard: All critical tasks evaluated as SAT.

Required Materials: None.

General References: 6610-ADM-4250.11, Releasing Radioactive Gaseous Effluents – Waste Gas Tanks A/B/C, Rev 13.

Handout: 6610-ADM-4250.11, Releasing Radioactive Gaseous Effluents – Waste Gas Tanks A/B/C, Rev 13, with Exhibit 2, Form 1622 filled out.

Cumulative Dose Summary Printout

Dose Summary Report Printout
Chemistry Report Printout

Initiating Cue: Review for approval the Gaseous Release Permit for the “A” Waste Gas Tank in accordance with 6610-ADM-4250.11, Releasing Radioactive Gaseous Effluents – Waste Gas Tanks A/B/C.

Time Critical Task: NO

Validation Time: 20 minutes

SIMULATOR SETUP

N/A

(Denote Critical Steps with a check mark)

START TIME: ____________

6610-ADM-4250.11, Step 4.1.C

√ **Performance Step: 1**
A WGDT should not be released unless another one of the WGDT's is greater than 65 psig based on ALARA considerations. Due to the shorter half lives of most noble gases and iodines any hold up time for a WGDT release will decrease the final curies released and the related offsite dose. However, other operational factors as determined by the Shift Manager, such as hydrogen/oxygen concentrations, may require releases in a more timely fashion.

Standard:
Candidate recognizes that "B" Waste Gas Tank is less than 65# with no reason stated on Form 1622-1, Section {3}.

Comment:

6610-ADM-4250.11, Step 4.1.D

√ **Performance Step: 2**
A Waste Gas Decay Tank release should start within 48 hours of the gas sample off time. If not, then Shift Management must confirm that the tank isolation valves remained closed and the tank pressure did not increase above 1 psig. If uncertain, then CANCEL the existing release permit and initiate a new permit and direct Chemistry to resample the tank.

Standard:
Candidate recognizes that it has been greater than 48 hours since the gas sample off time. Determines from initial conditions given that the tank isolation valves have remained closed during the time, but that tank pressure has increased above 1 psig. Determines that the release permit must be cancelled, a new permit initiated, and that Chemistry must resample the tank.

Comment:

6610-ADM-4250.11, Step 4.2

√ **Performance Step: 3** The RP Supervisor shall sign the Release Recommended By line on Form 1622-2 and the Rad. Anal. Reviewed By line on Form 1622-3.

Standard: Candidate recognizes that the RP Supervisor did not sign/date the "Radiological Analysis Reviewed By" line on Form 1622-3

Comment:

Terminating Cue: **When the paperwork is reviewed and the candidate determines whether or not to sign the permit: Evaluation on this JPM is complete.**

STOP TIME: ______________ **TIME CRITICAL STOP TIME:** N/A

Job Performance Measure No.: TMI 2012 NRC JPM SRO A3

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________________ Date: ________________

INITIAL CONDITIONS:

- You are the Shift Manager.
- The instructor/examiner will act as all other personnel.
- The plant is at 100% power.
- A Gaseous Release Permit was started for the “A” Waste Gas Tank.
- The “A” Waste Gas Tank was isolated 4.5 days ago and no valve manipulations have occurred since isolation.
- The “A” Waste Gas Tank Pressure is 80 psig.
- This is a routine release; no emergency or concern exists.

INITIATING CUE:

Review for approval the Gaseous Release Permit for the “A” Waste Gas Tank in accordance with 6610-ADM-4250.11, Releasing Radioactive Gaseous Effluents – Waste Gas Tanks A/B/C.

TIME CRITICAL:

No

Facility:	TMI Unit 1	Task No.:	EPAA101006
Task Title:	IDENTIFY AND DECLARE AN EMERGENCY CLASSIFICATION WITH A PAR	JPM No.:	2012 NRC JPM SRO A4
K/A Reference:	2.4.41 (2.9/4.6)		

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: Actual Performance: X

Classroom X Simulator Plant

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- You are the Shift Manager.
- The instructor/examiner will act as all other personnel.
- The plant is at 100% power.
- EG-Y-1A is OOS, 24 hours into a 72 hour expected outage.

Sequence of Events:

1300	• Large Break LOCA resulting in ESAS actuations, 4#RB, 30# RB, 1600psig RCS, 500psig RCS.
1301	• Reactor failed to automatically trip, a manual trip was performed successfully from Console Center.
1302	• Reactor Coolant Pumps were manually tripped based on indication of 5°F superheat.
1315	• An Alert was declared FA1 based on 1 barrier lost (Coolant) with a concurrent MA3.
1320	• Loss of the 8 Bus, EG-Y-1B failed to start.
1330	• SBO start failure, major damage reported.

Current Conditions:

1400 (Current Time)	• Loss of the 4 Bus.
	• Now indicating 30°F superheat.
	• Dispatcher indicating restoration of 4 and 8 busses in 2 hours.
	• Maintenance supervisor indicates SBO restoration in 30 minutes.
	• Outside temperature is 72°F.
	• The wind is from 270° at 5 MPH.

Task Standard: Critical facility requirements for declaring a GE and making a PAR completed within the required time limit.

Required Materials: Perform in a location with:

- EAL Matrix
- Shift Emergency Director Book

General References:

- EP-AA-111, EMERGENCY CLASSIFICATION AND PROTECTIVE ACTION RECOMMENDATIONS, Revision 16
- EP-AA-111-F-09, TMI PLANT BASED PAR FLOWCHART, Revision D
- EP-AA-112-100-F-01, SHIFT EMERGENCY DIRECTOR CHECKLIST, Revision L
- EP-AA-112-F-09, EMERGENCY PUBLIC ADDRESS ANNOUNCEMENTS, Revision C
- EP-MA-114-100-F-01, STATE/LOCAL EVENT NOTIFICATION FORM, Revision J
- EP-AA-1009 EXELON NUCLEAR RADIOLOGICAL EMERGENCY PLAN ANNEX FOR THREE MILE ISLAND (TMI) STATION Revision 17
- EP-AA-112-100-F-07 MID-ATLANTIC ERO NOTIFICATION OR AUGMENTATION Revision F.

Handouts: EP-AA-112-100-F-01, SHIFT EMERGENCY DIRECTOR CHECKLIST, signed off for the declared alert.

Initiating Cue: Respond in accordance with the EP-AA-112-100-F-01, SHIFT EMERGENCY DIRECTOR CHECKLIST.

Time Critical Task: Yes

Validation Time: 20 minutes

SIMULATOR SETUP

N/A

(Denote Critical Steps with a check mark)

START TIME: ____________

(When Cue is acknowledged – this is also Time Critical Start Time)

Evaluator Cue: **Inform candidate Time Critical time starts with acknowledgement of CUE.**

EP-AA-1009, Table TMI 3-1

Performance Step: 1 Compares updated conditions to the EAL Table.

Standard:

- Determines Loss of power to both Auxiliary transformers,
- And failure of all three Emergency Diesel Generators,
- And >25°F Superheat.
- Determines conditions are met for GENERAL EMERGENCY EAL MG1.

Comment:

EP-AA-112-100-F-01, Shift Emergency Director Checklist

Performance Step: 2 Implement EP-AA-112-100-F-01 for GE.

Standard: Refers to Section 1.4.

Comment:

EP-AA-112-100-F-01, Section 1.4, Step.A

√ **Performance Step: 3** Announce the event classification, possible escalation paths, and declaration time to the Control Room staff.

Standard: Declares GE based on Loss of power to both auxiliary transformers AND failure of all diesels AND > 25°F superheat, possible escalation paths, and declaration time.

Comment:

√ Time Critical #1 Time start _______ - Time of declaration _______ = ________

Standard: Less than 15 minutes.

EP-AA-112-100-F-01, Section 1.4, Step.B

Performance Step: 4 Record the EAL, threshold(s) (as applicable), and declaration time.

Standard: Records an EAL of MG1, thresholds of 1,2,3b, and the time of declaration on EP-AA-112-100-F01.

Comment:

EP-AA-112-100-F-01, Section 1.4, Step.C

Performance Step: 5 For Security events use site-specific Operations/Security procedures for announcements and consider the limitations the threat poses on personnel movement with Security prior to sounding alarms or making announcements.

Standard: N/A – not a security event.

Comment:

EP-AA-112-100-F-01, Section 1.4, Step.D

√ **Performance Step: 6** Select the Emergency Public Address Announcements from the form and direct performance of the public address announcement for a General Emergency within 15 minutes of event classification.

Standard: Fills out Step 5.2.B of EP-AA-112-F-09 (found behind tab 1) with a brief description and hands to communicator (NRC examiner) to make the announcement.

Comment:

Evaluator Note: **EP-AA-112-100-F-01, Section 1.4, Step.E is N/A**

Evaluator Cue: **If Shift Dose Assessor is requested to provide DAPAR information respond "Offsite dose projections are < 1 REM TEDE and < 5REM CDE thyroid".**

EP-AA-112-100-F-01, Section 1.4, Step.F

√ **Performance Step: 7** DETERMINE the correct plant-based PAR per the Emergency Classification and Protective Action Recommendations procedure and the appropriate site-specific PAR flowchart:

Classification and PAR Procedure TAB 6

Plant Based PAR Flowchart TAB 7

Standard: Determine PAR IAW EP-AA-111-F-09;

GE – Yes

Release – No

Loss of Fuel Clad – No

Therefore:

- Evacuate 5 Mile Radius
- Recommend KI for General Public in Evacuated Areas.
- Advise remainder of EPZ to monitor EAS Messages.

Comment:

Procedure Note: If a higher classification is made prior to transmitting an event notification, notification for the higher classification can supercede the previous event notification, provided that it can be performed within the 15 minute timeframe of the prvious event.

If the notification of a higher classification cannot be performed within the 15 minute timeframe of the previous event, the previous event notification is required within its 15 minute timeframe, and the subsequent event notification is required within its 15 minute timeframe.

EP-AA-112-100-F-01, Section 1.4, Step.G

√ **Performance Step: 8** Direct performance of State/Local notifications within 15 minutes of the event classification as required per the Notifications procedure.

Notification Procedure (EP-MA-114-100)

Notification Form (EP-MA-114-100-F-01)

Release in Progress Determination Guidance (EP-AA-114-F-01)

Standard: Fills out EP-MA-114-100-F-01 using EP-MA-114-100 and EP-AA-114-F-01 as guidance, hands to communicator (NRC Examiner).

Evaluator Note:

- **Minimum requirements on ENF to meet critical task:**

  3.a GENERAL EMERGENCY

  3.d ESCALATION

  4.a EMERGENCY ACTION LEVEL NO. is – MG1

  5.a NO radiological release in-progress

  7.b PAR Evacuate 360 checked, 5 miles filled in.

- **Record TIME _________ to be used as stop time for second critical time.**

Comment:

√ Time Critical #2

Time start of 2nd cue	_______
Time State/Local Event Notification Form complete	- _______
	= _______

Standard: Less than 15 minutes.

Terminating Cue: **When the candidate hands the completed Emergency Notification Form to the Communicator: Evaluation on this JPM is complete.**

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2012 NRC JPM SRO A4

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

Initial Conditions:	You are the Shift Manager.
	• The instructor/examiner will act as all other personnel.
	• The plant is at 100% power.
	• EG-Y-1A OOS 24 hours into a 72 hour expected outage.
Sequence of Events:	
1300	• Large Break LOCA resulting in ESAS actuations, 4#RB, 30# RB, 1600psig RCS, 500psig RCS.
1301	• Reactor failed to automatically trip, a manual trip was performed successfully from Console Center.
1302	• Reactor Coolant Pumps were manually tripped based on indication of 5°F superheat.
1315	• An Alert was declared FA1 based on 1 barrier lost (Coolant) with a concurrent MA3.
1320	• Loss of the 8 Bus, EG-Y-1B failed to start.
1330	• SBO start failure, major damage reported.
Current Conditions:	
1400 (Current Time)	• Loss of the 4 Bus.
	• Now indicating 30°F superheat.
	• Dispatcher indicating restoration of 4 and 8 busses in 2 hours.
	• Maintenance supervisor indicates SBO restoration in 30 minutes.
	• Outside temperature is 72°F.
	• The wind is from 270° at 5 MPH.

Initiating Cue: Respond in accordance with the EP-AA-112-100-F-01, SHIFT EMERGENCY DIRECTOR CHECKLIST.

Time Critical: Yes

Facility:	Three Mile Island Unit 1	Task No.:	62201026
Task Title:	Recover From CRD Sequence Fault (DCRDS)	JPM No.:	2012 NRC JPM A
K/A Reference:	SYS 001 A2.18 (3.2 / 3.8)		New JPM for ILT 10-02

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- You are the Unit Reactor Operator (URO).
- The instructor/examiner will act as the ARO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.
- ICS is in HAND IAW OP-TM-621-471, ICS Manual Control.
- A CRD Sequence Fault has just occurred.

Task Standard: All critical steps evaluated as SAT.

Required Materials: None

General References:

- OP-TM-MAP-G0202, CRD Sequence Fault, Rev 2
- OP-TM-622-412, Recovering from a Sequence Inhibit Caused by Excessive Overlap, Rev 3

Handout: None

Initiating Cue: Respond to alarm MAP G-2-2 for the CRD sequence fault.

Time Critical Task: No

Validation Time: 20 Minutes

SIMULATOR SETUP

1. Reset the simulator to Temp IC 253.

NOTE: It is okay to use a similar IC to the IC listed above, provided the IC actually used is verified to be compatible with this and other JPMs that are scheduled to be run concurrently.

2. When the above steps are completed for this and other JPMs to be run concurrently, then validate the concurrently run JPMs using the JPM Validation Checklist.
3. This completes the setup for this JPM.

(Denote Critical Steps with a check mark)

START TIME: ____________

OP-TM-MAP-G0202, Step 4.1

Performance Step: 1 Place Diamond Control in MANUAL IAW OP-TM-621-471, ICS Manual Control.

Standard: Examinee determines that the Diamond is in Manual Control by observing the Manual light is lit and the Auto light is dim on the Diamond Panel (CC).

Comment:

OP-TM-MAP-G0202, Step 4.2

Performance Step: 2 Ensure SEQ OR is selected on the Diamond Control.

Standard: Examinee determines that SEQ OR is already selected on the Diamond Control by observing the SEQ-OR light is illuminated and the SEQ light is dim on the Diamond Panel (CC).

Comment:

Evaluator Cue: **When the examinee states the need to refer to Tech Specs, inform him/her that the CRS is investigating.**

OP-TM-MAP-G0202, Step 4.3

Performance Step: 3 Refer to Tech Spec 3.5.2.5 for limits on Overlap.

Standard: Examinee states the need to refer to Tech Specs.

Comment:

OP-TM-MAP-G0202, Step 4.4.1

Performance Step: 4

If operating in the overlap region of sequential regulating rods, then perform the following:
Determine actual overlap between sequential regulating groups manually or per PPC Point C3561 CRD REG GROUP OVERLAP.

Standard:

Examinee determines overlap to be 31% by observing PPC Point C3561 or the PI Panel (PC).

Comment:

Evaluator Cue:

When the need to go to OP-TM-622-412 is stated, hand the examinee a copy of OP-TM-622-412.

OP-TM-MAP-G0202, Step 4.4.2

Performance Step: 5

If operating in the overlap region of sequential regulating rods, then perform the following:
Adjust overlap to 25% (24% to 26%) IAW OP-TM-622-412, Recovering from a Sequence Error.

Standard:

Examinee Goes to OP-TM-622-412.

Comment:

Evaluator Note:

OP-TM-622-412, Precautions, Limitations, and Prerequisites should be addressed, and are all met.

Procedure Note:

PPC Point C3561 has alarms at 20% (Lo-Lo), 22% (Lo), 28% (Hi), and 30% (Hi-Hi). These do not affect the DCRDCS sequence error circuitry, which is set at 22%.

OP-TM-622-412, step 4.1

Performance Step: 6
Attempt to confirm the actual overlap using the following:
- RPI Group Averages (PPC Points C3605, C3606, and C3607)
- PPC Point C3561, Control Rod Overlap

Standard: Examinee confirms the actual overlap to be approximately 28-31% as read on PPC Points C3605-C3607, and/or C3561.

Comment:

Evaluator Cue: **When stated to refer to Tech Specs, inform the examinee that the CRS is addressing Tech Specs.**

Procedure Note: **Control Rod Overlap should be maintained as close as possible to 25%. Tech Spec 3.5.2.5 requires it be maintained 25 +/-5%. Changing overlap may affect imbalance.**

OP-TM-622-412, step 4.2

Performance Step: 7
Refer to Tech Spec 3.5.2.5.

Standard: Examinee states the need to refer to Tech Specs.

Comment:

OP-TM-622-412, step 4.3

Performance Step: 8
Verify Rod Control is in Manual IAW OP-TM-621-471, ICS Manual Control.

Standard: Examinee determines that the Diamond is in Manual Control by observing the Manual light is lit and the Auto light is dim on the Diamond Panel (CC).

Comment:

OP-TM-622-412, step 4.4

Performance Step: 9 Ensure SEQ-OR is selected on SEQ/SEQ OR switch.

Standard: Examinee ensures that SEQ-OR is selected by observing the SEQ-OR light is illuminated and the SEQ light is dim on the Diamond Panel (CC).

Comment:

Procedure Note: **It is desirable to insert a group to correct overlap rather than withdrawing the group in sequence with it.**

- **Example: If overlap between Groups 6 and 7 is 33%, then Group 7 should be inserted to correct overlap rather than withdrawing Group 6.**
- **Example: If overlap between Groups 6 and 7 is 18%, then Group 6 should be inserted to correct overlap rather than withdrawing Group 7.**

OP-TM-622-412, step 4.5

√ **Performance Step: 10** Select the affected regulating group on GROUP SELECT SWITCH.

Standard: Examinee selects Group 7 on the GROUP SELECT SWITCH by turning the switch to the position labeled 7 (CC).

Comment:

OP-TM-622-412, step 4.6

√ **Performance Step: 11** Select ALL on the SINGLE SELECT SWITCH.

Standard: Examinee selects ALL on the GROUP SELECT SWITCH by turning the switch to the position labeled ALL (CC).

Comment:

OP-TM-622-412, step 4.7

√ **Performance Step: 12** Insert the group up to 2% from its present position.

Standard: Examinee inserts Group 7 by taking the Manual Rod control switch on the Diamond Panel to the "INSERT" position until rods have inserted 2%, which is when the examinee releases the switch and verifies rod movement has stopped.

Comment:

Evaluator Note: **The examinee should insert rods until 24-26%, as directed from OP-TM-MAP-G0202, step 4.4.2.**

OP-TM-622-412, step 4.8

√ **Performance Step: 13** When the plant is stable, then repeat Step 4.7 until overlap is adjusted to the desired value

Standard: Examinee repeats step 4.7 until overlap is 23-27%.

Comment:

Terminating Cue: **When the candidate is within has adjusted for overlap and continues on in the procedure; the JPM may be terminated.**

STOP TIME: ____________________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2012 NRC JPM A

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- You are the Unit Reactor Operator (URO).
- The instructor/examiner will act as the ARO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.
- ICS is in HAND IAW OP-TM-621-471, ICS Manual Control.
- A CRD Sequence Fault has just occurred.

INITIATING CUE:

Respond to alarm MAP G-2-2 for the CRD sequence fault.

Facility:	THREE MILE ISLAND	Task No.:	21101016
Task Title:	Respond To High Pressure Injection Initiation (Alt Path – MU-V-14A Fails To Open).	JPM No.:	2012 NRC JPM B
K/A Reference:	SYS 006 A2.02 (3.9 / 4.3)	Facility Bank:	2003 NRC JPM B.1.c

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- You are the Unit Reactor Operator (URO).
- The instructor/examiner will act as the ARO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.
- There is a LOCA inside the RB.
- ESAS has been manually actuated due to rising RB pressure approaching setpoint.

Task Standard: All critical steps SAT

Required Materials: None

General References:

- OP-TM-211-901 Emergency Injection (HPI/LPI), Rev. 5
- OP-TM-642-902, 4 PSIG ESAS Actuation, Rev. 2
- OP-TM-642-901, 1600 PSIG ESAS Actuation, Rev. 2

Handout None

Initiating Cue: The Unit Supervisor directs you to verify and respond to the ESAS actuation.

Time Critical Task: N/A

Validation Time: 10 minutes

SIMULATOR SETUP

Exam Setup: IC 16 (IC-255)

- Select IC-16 - 100% hot full power (Temporarily snapped in IC-253)
- Activate malfunction MU24A – Makeup Valve ES Alignment Failure (MU-V-14A) immediately
- Activate DI 02A5S59-ZDIPBOMUV14A (OFF) – Overrides MU-V-14A OPEN Pushbutton DI (false) immediately.
- Activate malfunction TH05 at 0.3%.
-
- Initiate 4 psig MANUAL ESAS ACTUATION.
-
- Monitor MUMMT set to 30500
- Make snapshot when all ES valves have traveled to their ES positions, including 4# ES.

- MALFUNCTIONS:
  - MU24A – Makeup Valve ES Alignment Failure (MU-V-14A).
  - TH05 at 0.3%.
  - FREEZE the simulator.

- OVERRIDES:
  - 02A5S59-ZDIPBOMUV14A (OFF) – Overrides MU-V-14A OPEN Pushbutton DI (false).

(Denote Critical Steps with a check mark)

START TIME: ________

Evaluator Cue: **Provide a copy of OP-TM-211-901 when required.**

Procedure Note: **There are special usage requirements for Section 4.1 and Attachments 7.1, 7.2 and 7.3. These actions are memory items (IAW OS-24) and performed from memory when required. The sequence of actuation and verification of ES is not train dependent. Either train may be performed first or trains may be performed in parallel.**

OP-TM-211-901, 4.1.2

Performance Step: 1 If ESAS Train A "Load Seq Block 4" lights (PCR) are not BLUE, then PRESS "Manual ES Actuation" "1600 PSIG RC PRESS" (Train A CC).

Standard: Examinee determines the ESAS Train A "Load Seq Block 4" lights (PCR) are BLUE.

Comment:

Evaluator Note: **The examinee may attempt to open MU-V-14A as allowed by OS-24, Conduct of Operations During Abnormal and Emergency Events.**

Procedure Note: **PCR graphic display is equivalent to Attachment 7.1**

OP-TM-211-901, 4.1.3

Performance Step: 2 If any of the components on Attachment 7.1 are not in the required condition, then INITIATE Section 4.2.

Standard: Examinee determines MU-V-14A is NOT open and that section 4.2 must be initiated.

Comment:

Evaluator Note: **Alternate Path #1 begins here with recognition of failure of MU-V-14A to open and the requirement to go to section 4.2**

Evaluator Cue: **The candidate may require CRS permission to clear the ES signals.**
If asked, as CRS, state "You have permission to clear the ES signals"

OP-TM-211-901, 4.2.1.2.A.

Performance Step: 3 If all three MU pumps are operating, then perform the following:
- DEFEAT ESAS IAW OP-TM-642-901 "1600 psig ESAS Actuation"

Standard: Examinee verifies all three Makeup Pumps are operating and goes to OP-TM-642-901.

Comment:

Evaluator Note: **ESAS signal bypass/defeat steps are delineated in OP-TM-642-901 and OP-TM-642-902; however it is a management EXPECTATION that examinees can defeat/bypass ESAS signals from memory.**

Evaluator Cue: **If the candidate needs it, provide a copy of OP-TM-642-901 and/or OP-TM-642-902.**

OP-TM-642-902 Attachment 7.1 Step 7.1

√ **Performance Step: 4**

If any (GR1, GR2 or GR3) Train "A" 4 PSIG "MANUAL ACTUATION" (PCR) BLUE lights are ON, then PERFORM the following:

- PRESS "4 PSIG RB PRESS" and "1600 PSIG RC PRESS" Manual ES Actuation "DEFEAT/ENABLE" pushbuttons (CC) to place each of the following in DEFEAT:
    - PB2/RBA
    - PB3/RBA
    - PB4/RBA
    - PB2/RCA
    - PB3/RCA
    - PB4/RCA
- VERIFY all (GR1, GR2 and GR3) Train "A" 4 PSIG "MANUAL ACTUATION" (PCR) BLUE lights are OFF.
- PRESS "4 PSIG RB PRESS" and "1600 PSIG RC PRESS" Manual ES Actuation "DEFEAT/ENABLE" pushbuttons (CC) to place each of the following in ENABLE:
    - PB2/RBA
    - PB3/RBA
    - PB4/RBA
    - PB2/RCA
    - PB3/RCA
    - PB4/RCA
- Verify all Train "A" "4 PSIG RB PRESS" Manual ES Actuation "DEFEAT/ENABLE" pushbutton lights (CC) indicate ENABLE

Standard:

Examinee presses "4 PSIG RB PRESS" and "1600 PSIG RC PRESS" Manual ES Actuation "DEFEAT/ENABLE" pushbuttons (CC) to place each in DEFEAT and verifies all (GR1, GR2 and GR3) Train "A" 4 PSIG "MANUAL ACTUATION" (PCR) BLUE lights are OFF.

Examinee presses "4 PSIG RB PRESS" and "1600 PSIG RC PRESS" Manual ES Actuation "DEFEAT/ENABLE" pushbuttons (CC) to place each in ENABLE and verifies all Train "A" "4 PSIG RB PRESS" Manual ES Actuation "DEFEAT/ENABLE" pushbutton lights (CC) indicate ENABLE

Comment:

OP-TM-642-902 Attachment 7.2 Step 7.1

Performance Step: 5

If any (GR1, GR2 or GR3) Train "B" 4 PSIG "MANUAL ACTUATION" (PCR) BLUE lights are ON, then PERFORM the following:

- PRESS "4 PSIG RB PRESS" and "1600 PSIG RC PRESS" Manual ES Actuation "DEFEAT/ENABLE" pushbuttons (CR) to place each of the following in DEFEAT:
  - PB2/RBB
  - PB3/RBB
  - PB4/RBB
  - PB2/RCB
  - PB3/RCB
  - PB4/RCB
- VERIFY all (GR1, GR2 and GR3) Train "B" 4 PSIG "MANUAL ACTUATION" (PCR) BLUE lights are OFF.
- PRESS "4 PSIG RB PRESS" and "1600 PSIG RC PRESS" Manual ES Actuation "DEFEAT/ENABLE" pushbuttons (CR) to place each of the following in ENABLE:
  - PB2/RBB
  - PB3/RBB
  - PB4/RBB
  - PB2/RCB
  - PB3/RCB
  - PB4/RCB
- Verify all Train "B" "4 PSIG RB PRESS" Manual ES Actuation "DEFEAT/ENABLE" pushbutton lights (CR) indicate ENABLE

Standard:

Examinee presses "4 PSIG RB PRESS" and "1600 PSIG RC PRESS" Manual ES Actuation "DEFEAT/ENABLE" pushbuttons (CR) to place each in DEFEAT and verifies all (GR1, GR2 and GR3) Train "B" 4 PSIG "MANUAL ACTUATION" (PCR) BLUE lights are OFF.
Examinee presses "4 PSIG RB PRESS" and "1600 PSIG RC PRESS" Manual ES Actuation "DEFEAT/ENABLE" pushbuttons (CR) to place each in ENABLE and verifies all Train "B" "4 PSIG RB PRESS" Manual ES Actuation "DEFEAT/ENABLE" pushbutton lights (CC) indicate ENABLE.

Comment:

Evaluator Note: **OP-TM-642-902 Attachment 7.2 Step 7.2 is N/A.**

OP-TM-642-901 Attachment 7.2 Steps 7.2 - 7.4 are N/A. Student should go to OP-TM-211-901.

OP-TM-211-901 4.2.1 2. B

√ **Performance Step: 6** SHUTDOWN the ES selected pump lined up to MU & SI and PLACE CS in Normal-After-Stop. (e.g. normally MU-P-1A)

Standard: Examinee stops MU-P-1A by rotating the Control Switch to stop (green light illuminated).

Comment:

OP-TM-211-901 4.2.1.3

Performance Step: 7 Ensure MU-V-14A or MU-V-14B is open.

Standard: Examinee ensures MU-V-14B is open.

Comment:

Terminating Cue: **After MU-V-14B is verified OPEN: Evaluation on this JPM is complete.**

STOP TIME: ____________ **TIME CRITICAL STOP TIME:** ____________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2012 NRC JPM B

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

Initial Conditions:

- You are the Unit Reactor Operator (URO).
- The instructor/examiner will act as the ARO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.
- There is a LOCA inside the RB.
- ESAS has been manually actuated due to rising RB pressure approaching setpoint.

INITIATING CUE: The Unit Supervisor directs you to verify and respond to the ESAS actuation.

Facility:	THREE MILE ISLAND UNIT 1	Task No.:	54201006
Task Title:	Respond to an RCS leak into ICCW	JPM No.:	2012 NRC JPM C
K/A Reference:	EPE 009 EA2.02 (3.5/3.8)	New JPM – Alternate Path	

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: __X__

Classroom ______ Simulator __X__ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- For this event you are assigned the duties of the Unit RO.
- The instructor/examiner will act as the ARO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.
- The Reactor is operating at 100% power with ICS in full automatic.

Task Standard: All critical steps SAT

Required Materials:

- None

General References:

- OP-TM-MAP-C0302, IC SURGE TANK LEVEL HI/LO, Rev 3
- OP-TM-541-463, IC-T-1 Level Control, Rev 2

Handout: None

Initiating Cue: Respond to the cues and indications given by the simulator as well as any input from the CRS.

Time Critical Task: NO

Validation Time: 20 minutes

SIMULATOR SETUP

1. Reset the simulator to IC-16 (Temp IC 43)
2. Insert the following:

   A. Remote CCR30 to Close **Immediately**

   B. Override 03A1S08-ZLOICV79D(1) GRN to OFF **Immediately**

   C. Override 03A1S07-ZLOICV79D(2) RED to OFF **Immediately**

   D. Override 03A1M01-ZAOIC3LIA to 96 on Event #1

   E. Override 03A1M02-ZAOIC3LIB to 96 on Event #1

   F. Override 03A1S08-ZDIICV79D(2) CLS to ON on Event #1

   G. Annunciator C-3-2 to ON on Event #1

   H. Malfunction RM39 , Value of 5E5, 600 second ramp, on Event #1

   I. Override 03A1S07-ZDIICV79D(1) OPN to ON on Event #2

3. When the above steps are completed for this and other JPMs to be run concurrently then validate, if not previously validated, the concurrently run JPMs using the JPM Validation Checklist.\
4. This completes the setup for this JPM.

(Denote Critical Steps with a check mark)

START TIME: ____________

Booth Operator Cue: **When directed by the Lead Evaluator, insert Event #1.**

Performance Step: 1 Acknowledges alarm, enters OP-TM-MAP-C0302

Standard:

- Examinee acknowledges alarm, enters OP-TM-MAP-C0302.

Comment:

Examiner Cue: **The PPC value for ICCW Surge Tank level cannot be changed for this JPM. If the candidate attempts to determine ICCW Surge Tank level via the PPC, state that "the PPC reads 23.9 ft and steady".**

Booth Operator Cue: **If contacted as an Auxiliary Operator, or when directed by the Evaluator:**
Report as an Auxiliary Operator "ICCW Surge Tank level is still visible, steady at 24 ft".

Booth Operator Cue: **If directed to verify that IC-V-5 is closed, report back that IC-V-5 indicates closed locally.**

OP-TM-MAP-C0302, Step 4.1.1

Performance Step: 2 ENSURE IC-V-5 is Closed (makeup valve)

Standard:

- Examinee ensures IC-V-5 is Closed by verifying the system Makeup Switch to CCW is in the close position.

Comment:

Evaluator Cue: **When the examinee locates the proper procedure, provide a copy of OP-TM-541-463.**

Evaluator Cue: **If the student informs the CRS that the actions are outside of the Control Room, inform that an NLO will perform the procedure.**

OP-TM-MAP-C0302, Step 4.1.2

Performance Step: 3 CONTROL IC-T-1 level (drain) per OP-TM-541-463, IC-T-1 Level Control

Standard:

- Examinee contacts an NLO to perform OP-TM-541-463.

Comment:

OP-TM-MAP-C0302, Step 4.1.3

Performance Step: 4 If RM-L-9 is rising, then PERFORM the following:

Standard:

- Examinee verifies RM-L-9 IS rising and continues.

Comment:

OP-TM-MAP-C0302, Step 4.1.3.1

Performance Step: 5 IAAT IC-T-1 level indication cannot be maintained on scale, then PERFORM the following:

Standard: Examinee determines IC-T-1 level indication **can** be maintained on scale and does not perform the sub-steps.

Comment:

OP-TM-MAP-C0302, Step 4.1.3.2

Performance Step: 6

COMPARE trends of the following IC temperatures to determine source of leakage into ICCW:

- o A0490 IC TEMP OUT RC-P-1A CLR
- o A0491 IC TEMP OUT RC-P-1B CLR
- o A0492 IC TEMP OUT RC-P-1C CLR
- o A0493 IC TEMP OUT RC-P-1D CLR
- o A0495 IC TEMP OUT LETDOWN CLR A
- o A0496 IC TEMP OUT LETDOWN CLR B

Standard:

- Examinee trends IC temperatures on the PPC and determines the source of leakage into ICCW to be the RC-P-1D Thermal Barrier by observing an upward trend in temperature on data point A0493 IC TEMP OUT RC-P-1D CLR.

Comment:

Booth Operator Cue:

When called as an NLO to close the breaker for IC-V-79D, perform the following in proper order:

1. **Delete Override 03A1S08-ZDIICV79D(2) CLS**
2. **Insert Event #2**
3. **Delete Override 03A1S08-ZLOICV79D(1) GRN**
4. **Delete Override 03A1S07-ZLOICV79D(2) RED**
5. **Delete Override 03A1S08-ZDIICSV79D(1) OPEN**
6. **Report that the breaker for IC-V-79D has been closed.**

OP-TM-MAP-C0302, Step 4.1.3.3.B

Performance Step: 7

CLOSE breaker associated with isolation valve.

- – IC-V-79A (1A ES Valves MCC, Unit 3D)
- – IC-V-79B (1B ES Valves MCC, Unit 3D)
- – IC-V-79C (1A ES Valves MCC, Unit 7B)
- – IC-V-79D (1B ES Valves MCC, Unit 5A)

Standard:

- Examinee has an NLO close the breaker for IC-V-79D (1B ES Valves MCC, Unit 5A)

Comment:

OP-TM-MAP-C0302, Step 4.1.3.3.C

√ **Performance Step: 8**

CLOSE IC-V-79 valve associated with affected RCP

Standard:

Examinee closes IC-V-79D by pressing the close pushbutton and verifying that the closed light is lit and the open light is not lit.

Comment:

EVALUATOR NOTE: **Alternate Path begins.**

Booth Operator Cue: **Modify the following:**

- **Override 03A1M01-ZAOIC3LIA to 100**
- **Override 03A1M02-ZAOIC3LIB to 100**

Booth Operator Cue: **If contacted as an Auxiliary Operator, or when directed by the Evaluator:**

Report as an Auxiliary Operator "ICCW Surge Tank level has gone high off-scale on the local indication".

OP-TM-MAP-C0302, Step 4.1.3.1.A

√ **Performance Step: 9** IAAT IC-T-1 level indication cannot be maintained on scale, then PERFORM the following:

TRIP the reactor

Standard:

- Examinee verifies IC-T-1 level is off-scale high and trips the reactor by pressing the DSS and Reactor Trip pushbuttons and verifies the reactor is shutdown by noticing the rod bottom lights and/or Reactor Power is less than 5%.

Examiner's Cue **If the examinee starts a symptom check, state "The ARO will perform the symptom check".**

Comment:

OP-TM-MAP-C0302, Step 4.1.3.1.B

√ **Performance Step: 10** TRIP all four RC pumps

Standard:

- Examinee trips all four RC Pumps by rotating the control switch for all four RCP's counter-clockwise, verifying green flag indications and no amps on each RCP.

Comment:

OP-TM-MAP-C0302, Step 4.1.3.1.C

√ **Performance Step: 11** CLOSE IC-V-2 and IC-V-3

Standard:

- Examinee closes IC-V-2 and IC-V-3 by turning the switches for each on PCR to the close position, and by verifying the closed lights are lit and the open lights are not lit on the ES status board (PCR).

Comment:

Evaluator Cue: **If the student informs the CRS to initiate AOP-050, acknowledge the requirement.**

If the examinee attempts to initiate AOP-050, inform that the CRS will initiate the procedure.

OP-TM-MAP-C0302, Step 4.1.3D

Performance Step: 12 INITIATE OP-TM-AOP-050 "RCS Leakage"

Standard:

- Examinee informs the CRS to initiate OP-TM-AOP-050.

Comment:

Terminating Cue: **After IC-V-79D is closed and AOP-050 initiation has been addressed: Evaluation on this JPM may be terminated.**

STOP TIME: ______________ **TIME CRITICAL STOP TIME:** ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2012 NRC JPM C

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ________________________ Date: ______________

INITIAL CONDITIONS:

- For this event you are assigned the duties of the Unit RO.
- The instructor/examiner will act as the ARO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.
- The Reactor is operating at 100% power with ICS in full automatic.

INITIATING CUE:

Respond to the cues and indications given by the simulator as well as any input from the CRS.

Facility:	THREE MILE ISLAND UNIT 1	Task No.:	22601012
Task Title:	RCP #1 Seal Failure	JPM No.:	2012 NRC JPM D
K/A Reference:	SYS 003 A2.01 (3.5 / 3.9)	Previously on 2011 NRC Exam	

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- For this event you assigned the duties of the Third Reactor Operator (ARO).
- The instructor/examiner will act as the URO, ARO, and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.
- The plant is at 68% power, with FW-P-1B secured.

Task Standard: All critical steps evaluated as SAT.

Required Materials:

- OP-TM-226-153 Rev 1
- OP-TM-AOP-040 Rev 0

General References:

- OP-TM-MAP-F0103 (RCP Seal #1 Leak-Off Hi / Lo) Rev 1
- OP-TM-226-153, Shutdown RC-P-1C Rev 2
- OP-TM-AOP-040, RCP #1 Seal Failure, Rev 0
- OP-TM-MAP-F0106, RC Pump Lab Seal D/P Lo, Rev 2

Handout: None

Initiating Cue: Respond to the cues and indications given by the simulator as well as any input from the CRS.

Time Critical Task: NO

Validation Time: 15 minutes

SIMULATOR SETUP

- 100% IC16 (Temporarily snapped into IC-256)
- Reduce power per 1102-4 to 68% power
- Secure FW-P-1B

- Create the Following Events
  - Event 1 IMF MU19C 1
  - Event 2 MMF MU19C 2

(Denote Critical Steps with a check mark)

START TIME: ____________

Booth Operator Cue: **When directed enter Event 1.**

Performance Step: 1 Responds to alarms and indications.

Standard: Examinee enters OP-TM-MAP-F0103 (RCP Seal #1 Leak-Off Flow Hi / Lo).

Examinee identifies RC-P-1C as affected pump.

Comment:

OP-TM-MAP-F0103, Step 4.0/4.1.A

Performance Step: 2 Manual Actions required:

If Seal Number 1 Leak-off Flow (SLO) is ≥ 5 gpm, then Perform the following:

- IAAT Seal Number 1 Leak-off Flow (SLO) is > 6 gpm, then GO TO OP-TM-AOP-040, RC Pump Seal Failures.

Standard: Using PPC point A0950 or recorder MU-43-FR (PC), examinee determines Seal Leak-off is < 6 gpm and continues in OP-TM-MAP-F0103.

Comment:

Evaluator Cue: **If STA is requested to trend data, "STA is unavailable".**

OP-TM-MAP-F0103, Step 4.1.B

Performance Step: 3 Trend the following Parameters:

- Seal Number 1 Leak-off Flow (SLO) (MU-43-FR)(PCL)
- RCP Seal and Bearing Water Temperatures
- Lab Seal ΔP, RC-18-DPI-1/2/4 (CC)

Standard: Examinee will trend the following Parameters:

- Seal Number 1 Leak-off Flow (SLO) (MU-43-FR)(PCL)
- RCP Seal and Bearing Water Temperatures

Lab Seal ΔP, RC-18-DPI-1/2/4 (CC)

Examinee may use RCP Group on Plant Process Computer (PPC) to accomplish this or examinee may trend temperatures on computer while using Console Center for lab seal and the Panel Center Recorder for flows.

Comment:

OP-TM-MAP-F0103, Step 4.1.C

√ **Performance Step: 4**

Raise Seal Injection flow, as necessary to attempt to maintain lab seal DP positive on each RC pump. Adjust SI Flow H/A station setpoint or place MU-V-32 in manual. If lab seal DP indication is not available, then MAXIMIZE seal injection flow. Do not exceed 60 gpm.

Standard:

Examinee places MU-V-32 (CC) in hand by depressing White pushbutton on Console Center and raises flow by pushing toggle switch upward to MAXIMIZE Seal Injection flow (RC-P-1C has no seal injection ΔP gage)to a maximum of 60gpm as indicated on the controller gage.

Alternately, the examinee may leave MU-V-32 in AUTO and dial the demand by rotating clockwise until 60gpm is indicated on the controller gage.

Comment:

NOTE: Alternate Path Starts here. With entry of the next event, the previous "If At Any Time (IAAT)" step applies and the alarm response is exited (a GO TO step is exit criteria per OS-24). AOP OP-TM-AOP-040 is entered. Alternate path decision is that a previously identified condition is now met and mitigation strategy must change from alarm response manual to AOP.

Booth Operator

When Seal Injection is maximized and with Lead Evaluator concurrence, insert EVENT 2.

Evaluator Cue: **After candidate announces AOP-040 entry criteria:**
- **Hand a copy of OP-TM-AOP-040, and direct them to PERFORM.**

OP-TM-MAP-F0103 IAAT

Performance Step: 5 Examinee monitors seal leak-off flow in accordance with IAAT statement and determines it has exceeded 6 gpm.

Standard: Examinee announces need to transition to OP-TM-AOP-040

Comment:

OP-TM-AOP-040 Step 1.0

Performance Step: 6 Reviews entry criteria and determines entry met.

Standard: Examinee continues in procedure.

Comment:

OP-TM-AOP-040 Step 3.1

Performance Step: 7

IAAT any of the following exists:

- RC Pump #1 seal leakoff flow > 8 gpm

- Seal water temperature at radial bearing (A0521 through A0524) > 225°F

- #1 seal inlet temperature (A0525 thru A0528) > 235 °F

then perform the following:

A. Verify Reactor power will not challenge RPS limit when RCP is shutdown.

B. Trip affected RCP.

C. Go To step 3.5.

Standard:

Examinee determines none of the above applies at this time and leaves the step open.

Comment:

OP-TM-AOP-040 Step 3.2

Performance Step: 8

MAXIMIZE seal injection flow <u>not</u> to exceed 60 gpm.

Standard:

Examinee recognizes condition is met from Alarm response, continues in procedure.

Comment:

OP-TM-AOP-040 Step 3.3

Performance Step: 9 Initiate a power reduction using 1102-4 to within the appropriate limits (Reactor and MWe) based on shutdown of RCP {3 pumps = 75 % RTP 665 MWe}

Standard: Examinee determines Reactor Power and Generated Mega Watts are already below limits.

Comment:

Evaluator Cue: **When candidate shows they can locate OP-TM-226-153 provide an exam copy.**

OP-TM-AOP-040 Step 3.4

Performance Step: 10 When power (Reactor and Turbine) is within limits to support RCP shutdown, then PERFORM the following to shutdown affected RCP:

- OP-TM-226-153 (C RCP)

Standard: Examinee obtains OP-TM-226-153.

Comment:

Evaluator NOTE: **If candidate discusses the re-ratio need, inform them Assistant Reactor Operator is to handle feedwater.**

OP-TM-226-153 Steps 1.0 through 4.1

Performance Step: 11 Reviews Purpose, Limits and Precautions, first step of Main Body.

Standard: Examinee may discuss above, recognizes

- Pump is in operating mode
- Reactor power is low enough
- Turbine power is low enough
- A re-ratio of feedwater will occur

Procedure NOTE: **NOTE: A 2 / 1 RCP combination with OTSG levels > LLLs will require a re-ratio (≈70% / 30%) of Feedwater flow to A / B OTSG.**

Comment:

OP-TM-226-153 Step 4.2

Performance Step: 12 If Reactor power is > 20%, evaluate expected FW Flow requirements for new RCP combination, to minimize effects on delta Tc.

Standard: Examinee may evaluate re-ratio flows (approximately 4.8 Mlb/hr "A" loop and 2.1 Mlb/hr "B" loop).

Evaluator Cue: **If requested the Assistant Reactor Operator is responsible for feedwater flows.**

Comment:

Evaluator Cue: **If CRS is requested to determine if vibrations are required respond no.**

OP-TM-226-153 Step 4.3

Performance Step: 13 If desired and time is available, then NOTIFY Electrical Maintenance to monitor RC-P-1C vibrations.

Standard: Examinee determines time is not available.

Comment:

OP-TM-226-153 Step 4.4

Performance Step: 14 Place one of the following in Normal-After-Start:

- RC-P-2C-1, Oil Lift Pump AC HP (CC), or
- RC-P-2C-2, Oil Lift Pump DC HP (CC)

Standard: Examinee rotates extension control clockwise observing red light on green light off for 1lift pump

Comment:

Evaluator Cue: **If RCS Pressure rise is addressed, inform the examinee that "the URO will maintain pressure".**

RCS pressure will peak at approximately 2230 psig before turning.

OP-TM-226-153 Step 4.5

√ **Performance Step: 15** Place RC-P-1C in Pull-To-Lock.

Standard: Examinee rotates extension control counter-clockwise and pulls, observes Amps go to zero, red light off, green light on.

Examinee may also observe plant feedwater re-ratio (not part of JPM)

Comment:

Procedure Note: **Vibration levels at a low value with the absence of change indicates 0 rpm.**

OP-TM-226-153 Step 4.6

Performance Step: 16 VERIFY vibration readings indicate RC-P-1C has reached 0 rpm.

Standard: Examinee verifies that vibration readings (PLF) indicate RC-P-1C has reached 0 rpm.

Comment:

OP-TM-226-153 Step 4.7

Performance Step: 17 Place the following in Pull-To-Lock:

- RC-P-2C-2, Oil Lift Pump DC HP
- RC-P-2C-1, Oil Lift Pump AC HP

Standard: Examinee rotates extension control counter-clockwise and pulls, observes red light off, green light on (CC), and Annunciator F-2-3 is in alarm.

Comment:

Evaluator Cue: **Inform candidate that another crew member is making the log entry.**

OP-TM-226-153 Step 4.8

Performance Step: 18 Record RC-P-1C (226) is in Standby Mode in the CR Log.

Standard: N/A

Comment:

OP-TM-AOP-040 Step 3.5

√ **Performance Step: 19** When affected RCP stops rotating, then promptly CLOSE the following for the affected RCP: {MU-V-33C}

Standard: Examinee observes low vibration of Reactor Coolant Pump "C" vibration meters on Panel Left Front (PLF), then presses MU-V-33C close pushbutton on CC. Observes Red light off Green Light on.

Comment:

Terminating Cue: **After the candidate closes MU-V-33C the JPM may be terminated.**

STOP TIME: ____________ TIME CRITICAL STOP TIME: N/A

VERIFICATION OF COMPLETION

Job Performance Measure No.: TMI 2012 NRC JPM D

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

Initial Conditions:

- For this event you assigned the duties of the Third Reactor Operator (ARO).
- The instructor/examiner will act as the URO, ARO, and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.
- The plant is at 68% power, with FW-P-1B secured

Initiating Cue: Respond to the cues and indications given by the simulator as well as any input from the CRS.

TIME CRITICAL: No

Facility:	THREE MILE ISLAND UNIT 1	Task No.:	EOPG161001
Task Title:	Perform the required actions for EF-P-1 Trip	JPM No.:	2012 NRC JPM E
K/A Reference:	APE 054 AA1.02 (4.4 / 4.4)	Bank JPM # TQ-TM-104-424-J001	

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: __X__

Classroom ______ Simulator __X__ Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- You have been assigned the duties of Assistant Reactor Operator (ARO)
- The instructor/examiner will act as the URO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.
- The reactor has tripped following FW-P-1A and turbine trip.
- OP-TM-EOP-001, VSSV's, have just been completed.

Task Standard: All critical steps evaluated as SAT.

Required Materials: None

General References: OP-TM-424-901, Emergency Feedwater, Rev 1

Handout: None

Initiating Cue: You are to respond to any cues by the simulator or the CRS.

Time Critical Task: NO

Validation Time: 12 minutes

SIMULATOR SETUP

- 100% IC16 (Temporarily snapped into IC-254)

1. Assign Malfunction **FW15B** to **Event #1**. Trips FW-P-1B.
2. Assign Malfunction **FW17** on **Event #2** (Trips EF-P-1.)
3. Set Event **Trigger #2** to **fwnefp1>0.5** (EF-P-1 speed > 50%)
4. Immediately insert Malfunction **FW15A**. Trips FW-P-1A.
5. Immediately insert Malfunction, **TC01**, trips main turbine.
6. Perform IMAs & VSSVs of EOP-1 and mark up procedure.
7. Adjust FW valve D/P as necessary.
8. ALLOW PLANT STABILIZE. (Take a snapshot)
9. When the above steps are completed for this and other JPMs to be run concurrently, then validate the concurrently run JPMs using the JPM Validation Checklist.
10. This completes the setup for this JPM.

(Denote Critical Steps with a check mark)

START TIME: ____________

Booth Operator Cue: **When directed by the Evaluator, insert Event #1.**

Evaluator Cue: **When OP-TM-424-901 is located, provide a copy.**

Performance Step: 1 Enter OP-TM-424-901 for EFW actuation.

Standard: Examinee recognizes loss of MFW and enters OP-TM-424-901 for EFW actuation.

Comment:

Evaluator Note: **OP-TM-424-901, step 4.1.1 is N/A.**

Booth Operator Cue: **If directed to report to EF-V-30 area, respond that you are already there.**

OP-TM-424-901, Step 4.1.2

Performance Step: 2 DISPATCH an Auxiliary Operator (AO) to EF-V-30 area

Standard: Examinee verifies an auxiliary Operator is at the EF-V-30 area.

Comment:

OP-TM-424-901, Step 4.1.4

Performance Step: 3

VERIFY the following Emergency Feedwater pumps discharge pressure > OTSG pressure:
EF-P-1
EF-P-2A
EF-P-2B

Standard:

Examinee determines EF-P-1 discharge pressure < OTSG pressure looking at the indication on CC (EF-PI-65)

Comment:

OP-TM-424-901, Step 4.1.3

Performance Step: 4

IAAT steps 4.1.4, 4.1.5, or 4.1.6 of OP-TM-424-901 are not satisfied, then INITIATE Section 4.2 "Contingency Actions".

Standard:

Examinee determines 4.1.4 is not met and initiates OP-TM-424-901 Section 4.2 "Contingency Actions".

Comment:

Evaluator Note:

OP-TM-424-901, step 4.2.1 is N/A. Step 4.2.2.1 is not applicable at this time.

Procedure Note:

At a minimum, a steam path from one OTSG is required for EF-P-1 operation.

OP-TM-424-901, Step 4.2.2.2

Performance Step: 5

If OTSG A is available, then ENSURE the following valves are open:

MS-V-2A

MS-V-13A

Standard:

Examinee determines OTSG A is available and ensures MS-V-2A and MS-V-13A are open by observing the red "Open" indications on CC.

Comment:

OP-TM-424-901, Step 4.2.2.3

Performance Step: 6

If OTSG B is available, then ENSURE the following valves are open:

MS-V-2B

MS-V-13B

Standard:

Examinee determines OTSG B is available and ensures MS-V-2B and MS-V-13B are open by observing the red "Open" indications on CC.

Comment:

Procedure Note:

Attachment 1 provides for local manual control of MS-V-6

OP-TM-424-901, Step 4.2.2.4

Performance Step: 7

If MS-PI-204 < 140 psig, then ENSURE MS-V-6 is Open.

Standard:

Examinee determines MS-PI-204 > 140 psig.

Comment:

Evaluator Note: **If requested for CRS permission to defeat EFW actuation signals, then state: "You have CRS permission to defeat EFW actuation signals"**

OP-TM-424-901, Step 4.2.2.5.A

√ **Performance Step: 8** If EF-U-1 is tripped (Annunciator J-1-2), then perform the following:

ENSURE EFW actuation is in DEFEAT (8 switches)

Standard: Examinee determines EF-U-1 is tripped by observing Annunciator J-1-2, and takes all 8 EFW actuation switches to DEFEAT (CL and CC) by turning each switch to align with the word defeat, Annunciators J-1-3 and J-1-4 clear.

Comment:

OP-TM-424-901, Step 4.2.2.5.B

√ **Performance Step: 9** CLOSE MS-V-13A

Standard: Examinee closes MS-V-13A by depressing the green "Close" button on CC and verifying the Closed light is lit and the Open light is not lit.

Comment:

OP-TM-424-901, Step 4.2.2.5.C

√ **Performance Step: 10** CLOSE MS-V-13B

Standard: Examinee closes MS-V-13B by depressing the green "Close" button on CC and verifying the Closed light is lit and the Open light is not lit.

Comment:

Booth Operator Cue: **When directed, open MS-V-52 using remote FWR91 and report " MS-V-52 is open".**

If directed to read local pressure indication, inform the examinee that the local indication is broken and unreadable.

OP-TM-424-901, Step 4.2.2.5.D

Performance Step: 11 If MS-PI-204 (CC or locally) indicates > 50 psig, then OPEN MS-V-52

Standard: Examinee observes MS-PI-204 (CC or locally) indicates > 50 psig, then directs the opening of MS-V-52

Comment:

Booth Operator Cue: **When directed, close MS-V-52 using remote FWR91 and report " MS-V-52 is close".**

OP-TM-424-901, Step 4.2.2.5.E

Performance Step: 12 When MS-PI-204 < 50 psig, then CLOSE MS-V-52

Standard: Examinee observes MS-PI-204 (CC or locally) indicates < 50 psig, then directs the closing of MS-V-52

Comment:

Booth Operator Cue: **When directed to reset EF-P-1 overspeed trip:**

1. **Delete malfunction FW17**
2. **Reset using remote FWR82.**
3. **Report " EF-P-1 overspeed trip lever has been reset".**

OP-TM-424-901, Step 4.2.2.5.F

Performance Step: 13 RAISE stop valve arm from vertical to horizontal position, ALIGN stop valve arm with trip finger and ensure secure engagement, and SET the overspeed latch spring in the top notch of trip finger (furthest from governor housing) (IB 295: at EF-U-1)

Standard: Examinee directs the Auxiliary Operator (AO) to reset EF-P-1/EF-U-1 overspeed trip.

Comment:

OP-TM-424-901, Step 4.2.2.5.G

Performance Step: 14 VERIFY annunciator J-1-2, "EFW TURB PMP OS TRIP" Clears.

Standard: Examinee verifies annunciator J-1-2 is clear.

Comment:

Booth Operator Cue: **If directed to stand clear, state "all personnel are clear of EF-P-1.**

Examiner's Note: **Annunciator J-2-2 will alarm upon MS-V-13A opening, but then clear.**

OP-TM-424-901, Step 4.2.2.5.H

√ **Performance Step: 15** OPEN MS-V-13A

Standard: Examinee opens MS-V-13A by depressing the red "Open" button on CC and verifying the Open light is lit and the Closed light is not lit.

Comment:

OP-TM-424-901, Step 4.2.2.5.I

Performance Step: 16 OBSERVE EF-P-1 speed and discharge pressure.

Standard: Examinee observes EF-P-1 speed and discharge pressure on CC

Comment:

OP-TM-424-901, Step 4.2.2.5.J

Performance Step: 17 OPEN MS-V-13B

Standard: Examinee opens MS-V-13B by depressing the red "Open" button on CC and verifying the Open light is lit and the Closed light is not lit.

Comment:

Terminating Cue: **When MS-V-13B is traveling open and EF-P-1 is running; JPM may be terminated.**

STOP TIME: ____________ TIME CRITICAL STOP TIME: N/A

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2012 NRC JPM E

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- You have been assigned the duties of Assistant Reactor Operator (ARO)
- The instructor/examiner will act as the URO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.
- The reactor has tripped following FW-P-1A and turbine trip.
- OP-TM-EOP-001, VSSV's, have just been completed.

INITIATING CUE: You are to respond to any cues by the simulator or the CRS.

TIME CRITICAL: No

Facility:	Three Mile Island Unit 1	Task No.:	42101001
Task Title:	Place an RPS Cabinet in Manual Bypass	JPM No.:	2012 NRC JPM F
K/A Reference:	SYS 012 A4.03 (3.6 / 3.6)	New Alt Path JPM for ILT 10-02	

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- You are the Third Reactor Operator.
- The instructor/examiner will act as the URO, ARO, and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.
- The Reactor is operating at 100% power with ICS in full automatic.
- I&C testing of "A" RPS is scheduled to take place and cannot be rescheduled.
- This maintenance is compliant with Tech Specs
- No other maintenance is scheduled.
- You are responsible for all alarm responses.

Task Standard: All critical steps evaluated as SAT.

Required Materials: None

General References: OP-TM-641-455, RPS CHANNEL MANUAL BYPASS, Rev 0

OP-TM-641-421, TRIPPING AND RESETTING RPS CHANNELS, Rev 2

OP-TM-MAP-G0102, RPS CHANNEL TRIP, Rev 3

Handout:	OP-TM-641-455, RPS CHANNEL MANUAL BYPASS, Rev 0 OP-TM-641-421, TRIPPING AND RESETTING RPS CHANNELS, Rev 2
Initiating Cue:	You are to place the "A" RPS cabinet in Manual-Bypass IAW OP-TM-641-455, RPS CHANNEL MANUAL BYPASS, to support I&C testing.
Time Critical Task:	No
Validation Time:	20 Minutes

SIMULATOR SETUP

1. Reset the simulator to Temp IC 259.

NOTE: It is okay to use a similar IC to the IC listed above, provided the IC actually used is verified to be compatible with this and other JPMs that are scheduled to be run concurrently.

2. Insert Override 17A1A30-ZAINI617PS(1) to OFF on EVENT #1.
3. Place Protected Equipment Stickers on appropriate RPS cabinets.
4. When the above steps are completed for this and other JPMs to be run concurrently, then validate the concurrently run JPMs using the JPM Validation Checklist.
5. This completes the setup for this JPM.

(Denote Critical Steps with a check mark)

START TIME: ____________

Booth Operator Cue: **When the JPM has begun, before any switch manipulation, and with Evaluator concurrence, INSERT EVENT #1.**

Evaluator Cue: **When Tech Specs are discussed, inform the examinee that the CRS has determined compliance with Tech Specs.**

Evaluator Note: **OP-TM-MAP-G0102 Step 4.1 is N/A**

OP-TM-MAP-G0102, Step 4.2.1

Performance Step: 1 If channel trip is otherwise unexpected, then perform the following:

- Comply with Tech Spec 3.5.1

Standard: Examinee informs the CRS of the need to comply with Tech Specs.

Comment:

Procedure Note: **Tripped bistables should have two bright lamps: (1) Output State and (2) Output Memory.**

OP-TM-MAP-G0102, Step 4.2.2

Performance Step: 2 If channel trip is otherwise unexpected, then perform the following:

- Check RPS bistables to determine cause of trip.

Standard: Examinee determines that "B" Power Range NI module has caused the trip by the output state and output memory lights appearing bright, and all cabinets showing a bright light on the outside, indicating B channel.

Comment:

Evaluator Note: ***OP-TM-MAP-G0102, Step 4.2.3 is N/A***

OP-TM-MAP-G0102, Step 4.2.4

Performance Step: 3 If channel trip is otherwise unexpected, then perform the following:

- If trip condition can not be cleared or the reason for the trip is not known, then place RPS channel in Manual Bypass IAW OP-TM-641-455.

Standard: Examinee determines that the trip condition can not be cleared and goes to OP-TM-641-455.

Comment:

Evaluator Cue: **As Shift Manager, give permission to manually bypass one RPS channel.**

If required, inform the candidate that the I&C Technicians have not yet started their maintenance.

Evaluator Note: **Precautions, Limitations, and Prerequisites are all met.**

OP-TM-641-455, Step 4.1 is N/A

OP-TM-641-455, Step 4.2.1

Performance Step: 4 If no channel in Manual Bypass (MAP G-3-1 Clear), then perform the following:
Verify no Vital Bus work in progress that could affect operable RPS channels.

Standard: Examinee verifies from the initial conditions that no vital bus work is in progress.

Comment:

OP-TM-641-455, Step 4.2.2

Performance Step: 5 If no channel in Manual Bypass (MAP G-3-1 Clear), then perform the following:

Place selected RPS Channel Manual Bypass Switch to BYPASS position using Key #6.

Standard: Examinee Places "B" RPS Cabinet Channel Manual Bypass Switch to BYPASS position by inserting Key #6 and turning it to "Manual Bypass"

Comment:

OP-TM-641-455, Step 4.2.2.a

Performance Step: 6 Verify Manual By-Pass lamp bright on Reactor Trip Module.

Standard: Examinee observes the red Manual By-Pass lamp is bright on Reactor Trip Module (B RPS cabinet)

Comment:

OP-TM-641-455, Step 4.2.2.b

Performance Step: 7 Verify Manual By-Pass lamp bright on outside of RPS cabinet.

Standard: Examinee observes the red Manual By-Pass lamp is bright on outside of RPS cabinet (B RPS cabinet).

Comment:

OP-TM-641-455, Step 4.2.2.c

Performance Step: 8 Verify alarm MAP G-3-1 In.

Standard: Examinee observes MAP G-3-1 is in by flashing light and audible alarm.

Comment:

Evaluator Cue: **Inform the examinee that another crew member will document B RPS Manual Bypass position change in the Control Room Logbook (OP-TM-641-455, Step 4.2.3).**

Alternate Path Begins

Evaluator Cue: **At this time, the student should restart OP-TM-641-455 to accomplish the assigned task.**

If the candidate asks for supervision direction, state that "The maintenance cannot be rescheduled, continue with the task".

Evaluator Note: **When identified, hand the examinee a new copy of OP-TM-641-455.**

Precautions, Limitations, and Prerequisites are still all met.

Procedure Note: **Performing next step/substeps will lead to a Reactor Trip if intent is to deenergize another RPS channel.**

OP-TM-641-455, Step 4.1.1

Performance Step: 9 If another channel in Manual Bypass due to an equipment problem, then perform the following:
Verify no other RPS channel is tripped.

Standard: Examinee verifies that no other RPS channel is tripped by observing the red Channel tripped lights being dim on the outside of all four RPS cabinets, and MAP G-1-2 being cleared.

Comment:

OP-TM-641-455, Step 4.1.2

Performance Step: 10 If another channel in Manual Bypass due to an equipment problem, then perform the following:

Place Channel already in Manual Bypass to a tripped state IAW OP-TM-641-421, Tripping and resetting RPS Channels.

Standard: Examinee goes to OP-TM-641-421.

Comment:

Evaluator Note: **Hand student OP-TM-641-421.**

Precautions, Limitations, and Prerequisites are still all met.

Procedure Note: **This section trips RPS channels. Resetting RPS channels is accomplished in section 5.0 of this procedure.**

Evaluator Cue: **As Shift Manager, grant permission to trip RPS channel(s).**

OP-TM-641-421, step 4.1

Performance Step: 11 Verify Shift Management concurrence to trip RPS channel(s)

Standard: Examinee obtains Shift Manager permission to trip "B" RPS channel.

Comment:

Evaluator Note: **OP-TM-641-421, Step 4.1.1 is N/A**

OP-TM-641-421, step 4.1.2

Performance Step: 12 Mark columns in step 4.2 as N/A for the channels not to be tripped

Standard: Examinee N/A's Section 4.2, columns for A, C, and D RPS Cabinets.

Comment:

OP-TM-641-421, step 4.1.3

Performance Step: 13 Verify all other RPS channels are reset (not tripped).

Standard: Examinee verifies that no other RPS channel is tripped by observing the red Channel tripped lights being dim on the outside of all four RPS cabinets, and MAP G-1-2 being cleared.

Comment:

Procedure Note: **Placing more than one RPS channel in test will cause a Reactor Trip.**

OP-TM-641-421, step 4.2.a

Performance Step: 14 Perform the following at the identified RPS Cabinet(s)

√

- Ensure channel is not in Manual Bypass

Standard: Examinee recognizes that B channel is in Manual Bypass and turns the switch, using Key #6 to Enable.

Comment:

OP-TM-641-421, step 4.2.b

Performance Step: 15 Perform the following at the identified RPS Cabinet(s)

√

- Place Contact Monitor Test module switch to TEST OPERATE

Standard: Examinee rotates the Contact Monitor Test module switch to TEST OPERATE, placing it in TEST OPERATE

Comment:

OP-TM-641-421, step 4.2.c

Performance Step: 16 Perform the following at the identified RPS Cabinet(s)

- Verify Alarm G-1-2 RPS Channel Trip In

Standard: Examinee verifies Alarm G-1-2 RPS Channel Trip in by flashing light and audible alarm.

Comment:

OP-TM-641-421, step 4.2.d

Performance Step: 17 Perform the following at the identified RPS Cabinet(s)

- Verify Reactor Trip Module (RTM) TEST TRIP lamp bright

Standard: Examinee verifies white Reactor Trip Module (RTM) TEST TRIP lamp is bright on the B RPS cabinet

Comment:

OP-TM-641-421, step 4.2.e

Performance Step: 18 Perform the following at the identified RPS Cabinet(s)

- Verify respective RTM Protective Subsystem lamp bright

Standard: Examinee verifies the yellow RTM Protective Subsystem lamps are bright on either the Reactor Trip module inside the B RPS cabinet or on the outside of A, C, and D RPS cabinets

Comment:

OP-TM-641-421, step 4.2.f

Performance Step: 19 Perform the following at the identified RPS Cabinet(s)

√

- Place Contact monitor Test module switch to OPERATE

Standard: Examinee turns the B RPS Contact Monitor Test Module switch to the OPERATE position to place in OPERATE.

Comment:

Evaluator Cue: **Inform the examinee that another crew member will document B RPS tripped state in the Control Room Logbook (OP-TM-641-421, Step 4.2.1).**

OP-TM-641-455, Step 4.1.2.A

Performance Step: 20 Verify Manual Bypass lamp dim on Reactor Trip Module

Standard: Examinee verifies that Manual Bypass lamp dim on B RPS Cabinet Reactor Trip Module.

Comment:

OP-TM-641-455, Step 4.1.2.B

Performance Step: 21 Verify alarm MAP G-3-1 Clear

Standard: Examinee verifies MAP G-3-1 is clear by the slow-flashing (or dim if acknowledged) light.

Comment:

OP-TM-641-455, Step 4.1.3

Performance Step: 22 Verify no Vital Bus work in progress that could affect operable RPS channels

Standard: Examinee verifies from the initial conditions that no vital bus work is in progress.

Comment:

Procedure Note: **Following step will place RPS in a 1 out of 2 logic for a reactor trip.**

OP-TM-641-455, Step 4.1.4

√ **Performance Step: 23** Place selected RPS Channel Manual Bypass Switch to BYPASS position using Key #6

Standard: Examinee Places "A" RPS Cabinet Channel Manual Bypass Switch to BYPASS position by inserting Key #6 and turning it to "Manual Bypass"

Comment:

OP-TM-641-455, Step 4.1.4.a

Performance Step: 24 Verify Manual By-Pass lamp bright on Reactor Trip Module.

Standard: Examinee observes the red Manual By-Pass lamp is bright on Reactor Trip Module (A RPS cabinet)

Comment:

OP-TM-641-455, Step 4.1.4.b

Performance Step: 25 Verify Manual By-Pass lamp bright on outside of RPS cabinet.

Standard: Examinee observes the red Manual By-Pass lamp is bright on outside of RPS cabinet (A RPS cabinet).

Comment:

OP-TM-641-455, Step 4.1.4.c

Performance Step: 26 Verify alarm MAP G-3-1 In.

Standard: Examinee observes MAP G-3-1 is in by flashing light and audible alarm.

Comment:

Evaluator Cue: **Inform the examinee that another crew member will document A RPS Manual Bypass position change in the Control Room Logbook (OP-TM-641-455, Step 4.2.3).**

Terminating Cue: **After the need to log A RPS in Manual Bypass is addressed, the JPM may be terminated.**

STOP TIME: ____________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2012 NRC JPM F

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________________ Date: __________________

INITIAL CONDITIONS:

- You are the Third Reactor Operator.
- The instructor/examiner will act as the URO, ARO, and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.
- The Reactor is operating at 100% power with ICS in full automatic.
- I&C testing of “A” RPS is scheduled to take place and cannot be rescheduled.
- This maintenance is compliant with Tech Specs
- No other maintenance is scheduled.
- You are responsible for all alarm responses.

INITIATING CUE:

You are to place the “A” RPS cabinet in Manual-Bypass IAW OP-TM-641-455, RPS CHANNEL MANUAL BYPASS, to support I&C testing.

Facility:	Three Mile Island Unit 1	Task No.:	EQC00002
Task Title:	Perform IMA's of EOP-020, Cooldown From Outside of Control Room	JPM No.:	2012 NRC JPM G
K/A Reference:	APE 068 AA1.23 (4.3 / 4.4)	New JPM for ILT 10-02	

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- You are the Unit Reactor Operator (URO).
- The instructor/examiner will act as the ARO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.
- Reactor is critical, 100% power, normal equipment lineups
- A fire has been reported in the Relay Room that threatens the ability to achieve safe shutdown from the Control Room.

Task Standard: All critical steps evaluated as SAT.

Required Materials: Stop Watch.

General References: OP-TM-EOP-020, Cooldown From Outside of Control Room, Rev 13

Handout: None

Initiating Cue: The CRS has directed you to perform the Immediate Manual Actions of OP-TM-EOP-020, Cooldown From Outside of Control Room.

Time Critical Task: Yes (OP-TM-102-106)

Validation Time: 5 Minutes

SIMULATOR SETUP

1. Reset the simulator to IC 116.
2. This completes the setup for this JPM.

(Denote Critical Steps with a check mark)

START TIME: ____________

OP-TM-EOP-020, Step 2.1

√ **Performance Step: 1** TRIP the reactor.

Standard: Examinee trips the reactor by pressing both the Reactor Trip and DSS pushbuttons.

Comment:

OP-TM-EOP-020, Step 2.2

Performance Step: 2 PERFORM EOP-001 Immediate Manual Actions.

Standard: Examinee verifies the reactor is shutdown by one or more of the following: Power Range NIs are less than 5% power as indicated on Console Center, all control rods are inserted, Source Range count rate is continuously lowering.

Examinee presses the Turbine Trip pushbutton.

Examinee verifies all Stop Valves are closed.

Examinee may perform a symptom check, and recognize that no symptoms currently exists.

Comment:

OP-TM-EOP-020, Step 2.3

√ **Performance Step: 3** PRESS MS-V-8A and MS-V-8B CLOSE pushbuttons.

Standard: Examinee presses the MS-A-8A and MS-V-8B Close pushbuttons on CC.

Comment:

OP-TM-EOP-020, Step 2.4

√ **Performance Step: 4** CLOSE RC-V-2.

Standard: Examinee closes RC-V-2 by pressing the close pushbutton and observing the green closed light is lit and the red open light is not lit (CC).

Comment:

OP-TM-EOP-020, Step 2.5

√ **Performance Step: 5** OPEN MU-V-14A and MU-V-14B.

Standard: Examinee presses the open pushbuttons for MU-V-14A and MU-V-14B and verifies Open by the Open lights being lit and the Closed lights Not being lit (CC)

Comment:

OP-TM-EOP-020, Step 2.6

√ **Performance Step: 6** STOP all reactor coolant pumps.

Standard: Examinee stops RCP A-D by turning each associated Control switch counter-clockwise, observing amps reduce, and verifying green light is lit, red light is not lit.

Comment:

Evaluator Note:	**The following step is time critical (75 seconds after the Control Room Evacuation has been determined to be required).**
Evaluator Note:	**Securing the RCP's causes MS-V-13A and MS-V-13B to automatically close. MS-V-13A closes immediately. MS-V-13B has a 40 second delay before closing. The candidate should manually close MS-V-13B before the delay has timed out.**
	OP-TM-EOP-020, Step 2.7
Performance Step: 7	Ensure MS-V-13A and MS-V-13B are Open.
Standard:	Examinee verifies MS-V-13A is open by the open light lit, closed light not lit (CC). Examinee ensures MS-V-13B is Open by the Open indicating light lit and the Closed indicating light not lit (CC).
Comment:	
Evaluator Cue:	**When asked if Control Room evacuation is required, state: "Control Room evacuation is required".** **Time begins for the Time Critical Actions.** **Time:________________**
Evaluator Cue:	**If asked if SCBA's are required, state: "SCBA's are not required".**
Procedure Note:	**IMAs should be performed by the URO…**
	OP-TM-EOP-020, Step 2.8
Performance Step: 8	When it is determined that Control Room evacuation is required, then continue.
Standard:	Examinee verifies that Control Room evacuation is required, and continues.
Comment:	

Evaluator Note: **The following step is time critical (75 seconds after the Control Room Evacuation has been determined to be required).**

OP-TM-EOP-020, Step 2.9

√ **Performance Step: 9** TRIP both main Feedwater Pumps.

Standard: Examinee presses the trip pushbuttons for FW-P-1A and FW-P-1B on CL and verifies the FW-P's are tripped by RPM's lowering (CL).

Comment:

Evaluator Note: **The following step is time critical (75 seconds after the Control Room Evacuation has been determined to be required).**

OP-TM-EOP-020, Step 2.10

√ **Performance Step: 10** TRIP all running Condensate Booster Pumps.

Standard: Examinee trips running Condensate Booster Pumps and verifies tripped by Green lights lit and Red lights not lit.

Comment:

Evaluator Note: **The following step is time critical (75 seconds after the Control Room Evacuation has been determined to be required).**

OP-TM-EOP-020, Step 2.11

√ **Performance Step: 11** TRIP all running Condensate Pumps.

Standard: Examinee trips running Condensate Pumps and verifies tripped by Green lights lit and Red lights not lit.

Comment:

Evaluator Note: **The following step is time critical (75 seconds after the Control Room Evacuation has been determined to be required).**

OP-TM-EOP-020, Step 2.12

√ **Performance Step: 12** PLACE EF-V-30A and EF-V-30C in Manual and ENSURE valve demands are set to 0%.

Standard: Examinee places EF-V-30A and EF-V-30C controllers in Manual by pressing the associated Manual pushbuttons (CL and CC) and ensures valve demands are set to 0% by fixing the controllers in the 0% demand position (CL and CC).

Comment:

Evaluator Note: **The following step is time critical (75 seconds after the Control Room Evacuation has been determined to be required).**

OP-TM-EOP-020, Step 2.13

√ **Performance Step: 13** PLACE EF-V-30B and EF-V-30D in Manual and SET valve demands to 15% to 25%.

Standard: Examinee places EF-V-30B and EF-V-30D controllers in Manual by pressing the associated Manual pushbuttons (CC and CL) and ensures valves are set to 15-25% by adjusting the manual controllers until 15-25% is observed on the demand control indication. (CC and CL).

Comment:

OP-TM-EOP-020, Step 2.14

Performance Step: 14 ANNOUNCE "reactor trip" and "______ requires commencing remote shutdown sequence," over the plant page and radio.

Standard: Examinee announces "reactor trip" and "a fire in the relay room requires commencing remote shutdown sequence," over the plant page and radio.

Comment:

Terminating Cue: **When the announcement has been made, the JPM may be terminated.**

STOP TIME: ____________

√ Time Critical Time Critical start ______ - Time of completion ______ = _______

Standard: Less than 75 seconds.

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2012 NRC JPM G

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ____________________ Date: ____________

INITIAL CONDITIONS:

- You are the Unit Reactor Operator (URO).
- The instructor/examiner will act as the ARO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.
- Reactor is critical, 100% power, normal equipment lineups
- A fire has been reported in the Relay Room that threatens the ability to achieve safe shutdown from the Control Room.

INITIATING CUE: The CRS has directed you to perform the Immediate Manual Actions of OP-TM-EOP-020, Cooldown From Outside of Control Room.

Time Critical Task: Yes

Facility:	Three Mile Island Unit 1	Task No.:	82301004
Task Title:	Establish Alternate RB Emergency Cooling	JPM No.:	2012 NRC JPM H
K/A Reference:	SYS 022 A2.06 (2.8 / 3.2)	New	

Examiner: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: ______ Actual Performance: X

Classroom ______ Simulator X Plant ______

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- You are the Third Reactor Operator (ARO).
- The instructor/examiner will act as the URO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.
- Summer day outside air temperature 76°F.
- RR-P-1B is OOS for motor overhaul.
- Loss of Off Site Power has occurred.
- OP-TM-AOP-020 is complete through step 3.27.
- The 1N Cross Tie Bus is not energized.

Task Standard: All critical steps evaluated as SAT.

Required Materials: OP-TM-AOP-020, Loss of Station Power Rev 15 signed off through and including 3.27.

OP-TM-823-901, RB Normal Cooling Without Offsite Power Rev 1 (Available)

OP-TM-534-901, RM Emergency Cooling Operations Rev 12 (Available)

General References:

Handout: OP-TM-AOP-020, Loss of Station Power Rev 15 signed off through and including 3.27.

Initiating Cue: The CRS has directed you to continue the actions of AOP-020 as he continues in the EOPs.

Time Critical Task: No

Validation Time: 40 Minutes

SIMULATOR SETUP

1. Reset the simulator to Temp IC 55
2. Tag RR-P-1B and RR-V-1B OOS.

NOTE: It is okay to use a similar IC to the IC listed below, provided the IC actually used is verified to be compatible with this and other JPMs that are scheduled to be run concurrently.

3. IC 55 was built as follows;
    1. From IC16 MOL 100% power
    2. Insert Malfunction ED01 Loss of Station Power.
    3. Carry out actions of OP-TM-EOP-001 and AOP-020 through step 3.27.
        a. Start DR-P-1A, DC-P-1A, MU-P-1A
        b. Use MU-V-14A and monitor point MUMMT as required for inventory.
        c. Set PZR setpoint to 100"
        d. Lower Turbine header setpoint to establish Natural Circulation
        e. Place Group 9 heaters on Emergency power as follows (in order)
            i. RCR30 PZR Heater Group 9 Bkr to OUT
            ii. RCR36 PZR GRP 9 Disconnect Device to EMER
            iii. RCR38 PZR GRP 9 Emergency Breaker to IN
            iv. RCR40 PZR GRP 9 breaker to ON
        f. Break vacuum as follows;
            i. Open VA-V-8 on console
            ii. FWR01 VA-V-4A set to 100%
            iii. FWR02 VA-V-4B set to 100%
            iv. All six VA-P's to PTL
            v. Monitor MSVGSV4 set to 0 to close GS-V-4

g. Align Ventilation as follows;

    i. Start AH-E-24B

    ii. Start AH-E-19B

    iii. Start AH-P-3B

    iv. Start AH-E-17B

    v. Start RM-A-1

h. Place the SBO on "C" 4160 volt bus IAW OP-TM-864-901.

i. Re-energize 1N Bus by closing N1-02 and 1N-02

j. Remove RR-P-1B from service as follows;

    i. Place in PTL

    ii. RWR08 RR-P-1B breaker to OUT

    iii. RWR25 RR-V-1B breaker to OPEN

k. Fault RR-P-1A by;

    i. 02A6S07-ZDIRRP1A (2) OFF

    ii. 02A6S07-ZDIRRP1A (3) OFF

    iii. 02A6S07-ZDIRRP1A (4) OFF

l. The following steps simulate the energizing of "A" RB H&V from D TP MCC

    i. ED0717 on event 1 to remove 1D TP MCC

    ii. FW Turn Gear: 05A6S19-ZDIFWY1B(5) PTL ON EVENT 2

    iii. CO-P-9B: 01A4A4DS1-ZLOCOP9B(2) OFF EVENT 2

    iv. AH-E-6A: 04A2DS21-ZLOCSAHE6A(1) OFF EVENT 2

    v. AH-E-7A: 04A2DS23-ZLOCSAHE7A(1) OFF EVENT 2

    vi. AH-E-2A: 13A7DS03-ZLOCSAHE2A(1) OFF EVENT 2

    vii. AH-E-3A: 13A7DS25-ZLOCSAHE3A(1) OFF EVENT 2

    viii. AH-E-4A: 13A7DS37-ZLOCSAHE4A(1) OFF EVENT 2

m. The following sets up power to “A” RB H&V while appearing off-site not available.

   i. Delete Malfunction ED01

   ii. Reset 4 lock-outs on RBB / RBA

   iii. Close 1B02 at SS-1

   iv. IO override on the following MAP alarms;

      1. NN-1-1 ON

      2. NN-1-2 ON

      3. N-1-6 ON

      4. AA-1-5 ON

   v. 1B02 Green 11A4DS10-ZLO1B02G ON

   vi. 1B02 Amber 11A4DS11-ZLO1B02Y ON

   vii. 1B02 Red 11A4DS12-ZLO1B02R OFF

   viii. Open 1C02 10A2S01-ZDIC102(1) ON

   ix. 10A2M01-ZAOC102A value 0

   x. 10A2M02-ZAOE102A value 0

   xi. 10A2M03-ZAO1CV value 0

   xii. 10A2M04-ZAO1DV value 0

   xiii. 10A2M05-ZAO1EV value 0

   xiv. 10A2DS04-ZLO1C02G OFF

   xv. 10A2DS05-ZLO1C02Y OFF

   xvi. 10A2DS06-ZLO1C02R ON

   xvii. 10A2DS01-ZLOC102G OFF

   xviii. 10A2DS02-ZLOC102Y OFF

   xix. 10A2DS03-ZLOC102R ON

   xx. 10A2DS07-ZLO1D02G OFF

   xxi. 10A2DS08-ZLO1D02Y OFF

xxii. 10A2DS09-ZLO1D02R ON

xxiii. 10A1M04-ZROB1A4 OFF

xxiv. 10A1DS01-ZLO1SAA2G ON

xxv. 10A1DS02-ZLO1SAA2Y ON

xxvi. 10A1DS03-ZLO1SAA2R OFF

xxvii. 10A1S03-ZDI1SAA2(2) ON Event 4 (restores power)

4. Setup > 130°F in the Reactor Building by setting:
   a. 05A1AR4-ZAOTR655A1 to 81%
   b. 05A1AR4-ZAOTR655B to 81%
   c. 05A1AR4-ZAOTR655C to 81%
   d. 05A1AR4-ZAOTR655D to 81%
   e. 05A1AR4-ZAOTR655E to 81%
   f. 05A1AR4-ZAOTR655F to 81%
   g. 05A1AR4-ZAOTR655G to 81%
   h. 05A1AR4-ZAOTR655H to 81%
   i. 05A1AR4-ZAOTR655I to 81%
   j. 05A1AR4-ZAOTR655J to 81%
   k. 05A1AR4-ZAOTR655K to 81%
   l. 05A1AR4-ZAOTR655L to 81%
   m. 05A1AR4-ZAOTR655P to 81%
   n. 05A1AR4-ZAOTR655U to 81%
   o. 05A1AR4-ZAOTR655W to 81%
   p. 05A1AR4-ZAOTR655X to 81%
   q. 05A1AR4-ZAOTR655Q to 81%
   r. Annunciator NN-2-7 to ON

Event Trigger #3 Event Action 0 Command DMF ED0717

Event Trigger #4 Event Action 0 Command DLO ZLOCSAHE2A(1)

Remote CCR32 to CLOSE

Annunciator H-1-2 to ON

Annunciator H-1-3 to ON

Override 03A5M01-ZAON102A AMP N1-02A Value of 7, insert immediately.

Delete A0023 from Scan (cannot be done prior to day of administration)

(Denote Critical Steps with a check mark)

START TIME: ____________

Booth Operator Cue: **Ensure A0023 is deleted from Scan (cannot be done prior to day of administration)**

OP-TM-AOP-020 3.28

Performance Step: 1 IAAT outside air temperature <32°F, then PERFORM OP-TM-823-432 "Winter Operating Guidelines for Industrial Coolers" to prevent damage from freezing.

Standard: Examinee leaves step open initial conditions indicated outside air temperature 76°F.

Comment:

OP-TM-AOP-020 3.29

Performance Step: 2 IAAT RB temperature > 130°F, then INITIATE RB Cooling IAW OP-TM-534-901

Standard: Examinee recognizes RB temperature > 130°F and announces entry into OP-TM-534-901, "RB Emergency Cooling Operations"

Comment:

Evaluator Note: **When Examinee requests permission of SM to initiate RR cooling, grant permission.**

ICO Note **NS-V-85 is closed in the initial setup. Report back that it is closed.**

OP-TM-534-901 Prerequisites and Step 4.1.1

Performance Step: 3

Prerequisites;
3.3.1 Verify System was in ES Standby.
3.3.2 Verify 1600 psig ES actuation, RB pressure approaching 2 psig or Emergency Director or Shift Manager has authorized use of RBEC.
3.3.3 Verify 1D or 1E 4160V Bus is energized.
4.1.1 Dispatch an operator to CLOSE NS-V-85.

Standard:

Examinee reviews prerequisites.
System noted in standby signed off.
Obtains SM permission.
Verifies 1D bus energized by observation of voltage on CR.
Examinee uses radio to have NLO close NS-V-85

Comment:

OP-TM-534-901 Step 4.1.3

Performance Step: 4

START or VERIFY running:
RR-P-1A

Standard:

Examinee rotates extension control for RR-P-1A on CC to start, pump fails to start. Examinee may refer to section 4.2 Contingency actions IAW step 4.1.2 however RR-P-1B is OOS and no viable alternate path exists here.

Comment:

Evaluator Note: **OP-TM-534-901 Step 4.2 Actions may be skipped per AOP-020 branching.**

OP-TM-534-901 Step 4.2

Performance Step: 5

4.2.1.1 START RR-P-1A
If RR-V-10A and RR-V-1A are closed OPEN RR-V-1A
4.2.1.2 START RR-P-1B
If RR-V-10B and RR-V-1B are closed OPEN RR-V-1B
4.2.1.3 If neither RR-P-1A/B can be started then CLOSE all RR-V-3's and RR-V-4's

Standard:

Recognizes RR-P-1A will not start, opening RR-V-1A will not need to be completed.
Recognizes RR-P-1B is OOS, opening RR-V-1B will not be allowed.
Closes RR-V-3A/B/C on CR by depressing close Pushbutton.
RR-V-4A/B/C/D are normally closed and would only be open if opened in step 4.1.3.

Comment:

NOTE: Alternate path starts here: Examinee returns to OP-TM-AOP-020 step 3.29 and initiates OP-TM-823-901 per the RNO column after evaluating the lack of off-site power.

Evaluator Cue: **If the student states that normal RB Emergency Cooling cannot be performed, state "Continue with the assigned task".**

Evaluator Note: **When Examinee has located OP-TM-823-901 provide the examinee with an exam copy.**

OP-TM-AOP-020 step 3.29 RNO

Performance Step: 6

INITIATE OP-TM-823-901, "RB Normal Cooling Without Offsite Power."

Standard:

Examinee announces transition to OP-TM-823-901

Comment:

Evaluator Note: **If examinee asks, "Clearance is in the field and you may proceed with the procedure."**

OP-TM-823-901

Performance Step: 7 Reviews Precautions

Standard: Examinee determines a clearance must be applied.

Comment:

OP-TM-823-901, Section 3.0

Performance Step: 8 Reviews Precautions, Limitations, and Prerequisites
3.3.1 Verify RB Emergency Cooling is not available.
3.3.2 Verify 1A and 1B 4160V buses are de-energized.
3.3.3 Verify 240 amps (@480V) can be added to 1N cross tie & diesel generator load.

Standard: Verifies RB Emergency Cooling is not available, signs step.
Verifies at PR 1A and 1B 4160V de-energized, signs step.
Verifies 1N crosstie is not used, may verify diesel load.

Comment:

Evaluator Note: **Inform Examinee that OP-TM-823-456 has been completed in the field.**

OP-TM-823-901 Step 4.1

Performance Step: 9 INITIATE OP-TM-823-456 to provide evaporation makeup to industrial cooler sump.

Standard: Examinee states OP-TM-823-901 will be initiated.

Comment:

Evaluator Note: **Note below step 4.1 drives 1A RB H&V MCC as preferred power.**

Procedure Note/Caution:

1. The use of **1A RB H&V MCC is PREFERRED**. The low level interlock for all of the spray pumps relies upon power from 1A RB H&V MCC.
2. To use 1A Reactor Bldg. H&V MCC and associated equipment **perform section 4.2.**
3. To use 1B Reactor Bldg. H&V MCC and associated equipment perform section 4.3.
4. Either section 4.2 (1A RB H&V) or 4.3 (1B RB H&V) may be utilized but NOT BOTH. N/A the section (4.2 or 4.3) not used.

CAUTION: Only one of 1A or 1B RB H&V MCC is to be energized.

ICO Note: **When directed to Install cross tie to 1A Reactor Bldg. H&V MCC: Insert Event 1 and inform examinee that "step 4.2.1 has been completed in its entirety by Ron Kilby (or an Auxiliary Operator if directed to) in the field, and that substep 6 (IV) Independent Verification was performed by Lonnie Brown (or a second Auxiliary Operator)".**

OP-TM-823-901 Step 4.2.1

Performance Step: 10 Install cross tie to 1A Reactor Bldg. H&V MCC as follows:

1. OPEN & TAG 1C 480V SWGR Unit 2A (Fdr bkr to 1C TP MCC) (TB 322: electrical switchgear room).
2. OPEN & TAG 1J 480V SWGR Unit 2A (Fdr bkr to 1D TP MCC) (TB 322: electrical switchgear room).
3. OPEN & TAG 1E 480V SWGR Unit 2C (Fdr bkr to 1A RB H&V MCC) (TB 322: north of elevator).
4. OPEN BKR and DISCONNECT the cables from the LOAD side of 1D TP MCC Unit 12D (Cross Tie to 1C TP MCC) (TB 322: southwest (above IWT).
5. OPEN BKR and DISCONNECT the cables from the LOAD side of 1A Reactor Bldg. H & V MCC Unit 1D (AH-C-168 Purge Supply Heater). (TB 322: north of elevator)
6. CONNECT temporary cable (minimum 3/C 350 MCM

Standard: Examinee determines that Section 4.2 is to be used. Reviews steps and determines they are all in the field. Directs an Auxiliary Operator or I&C Technician to perform the steps, then signs completed by whoever was contacted.

Comment:

OP-TM-823-901 Step 4.2.2.1

√ **Performance Step: 11**

To control loads after 1A Reactor Bldg. H&V MCC is energized: Place the following control switches in PTL:
AH-E-96A-EX1
AH-E-96B-EX1
AH-E-96C-EX1
AH-E-96D-EX1
AH-P-7A-EX1
AH-P-7B-EX1
AH-E-111A-EX1
AH-E-111B-EX1
AH-P-10A-EX1
AH-P-10C-EX1

Standard:

At H&V panel center: places the following in PTL by rotating counter clockwise and pulling:

- AH-E-96A-EX1
- AH-E-96B-EX1
- AH-E-96C-EX1
- AH-E-96D-EX1
- AH-P-7A-EX1
- AH-P-7B-EX1

At H&V panel side: places the following in PTL by rotating counter clockwise and pulling.

- AH-E-111A-EX1
- AH-E-111B-EX1
- AH-P-10A-EX1
- AH-P-10C-EX1

Comment:

ICO Note: **When directed to perform step 4.2.2.2, inform the candidate that "step 4.2.2.2 has been completed in its entirety by Ron Kilby (or an Auxiliary Operator if directed to) in the field".**

Insert Event 2 to simulate actions of step 4.2.2.2 and 3. Inform Examinee that Steps under 4.2.2.2 and 4.2.2.3 have been completed in their entirety by Ron Kilby (or an Auxiliary Operator if directed to) in the field

OP-TM-823-901 Step 4.2.2.2

Performance Step: 12 OPEN the following breakers on 1D Turbine Plant MCC (TB 322: southwest (above IWT):
A. Unit 1A (FW-Y-1B : FWP Turning Gear)
B. Unit 1E (SD-P-9B : TB sump pump)
C. Unit 2A: (CO-P-9B: CO-P-2B oil pump)
D. Unit 10E : (SD-P-5 : Turbine Bldg Deluge Sump Pump)
E. Unit 11AR : Heat Trace Panel 1A
F. Unit 13D : 1A Main Xfmr Emergency Power

Standard: Examinee reviews steps and determines they are all in the field. Directs an Auxiliary Operator or I&C Technician to perform the steps, then signs completed by whoever was contacted.

Comment:

ICO Note: **When directed to perform step 4.2.2.3, Insert Event 2 to simulate actions of steps 4.2.2.2 and 3. Inform Examinee that "Step 4.2.2.3 has been completed in its entirety by Ron Kilby (or an Auxiliary Operator if directed to) in the field".**

OP-TM-823-901 Steps 4.2.2.3, 4.2.2.4

Performance Step: 13 OPEN the following breakers on 1A Reactor Bldg. H&V MCC (TB 322: north of elevator):
A. Unit 2A (Industrial cooler immersion heater)
B. Unit 3C (AH-C-171 Purge Supply Heater)
C. Unit 4C (AH-E-6A)
D. Unit 4D (AH-E-2A)
E. Unit 5A (AH-E-3A)
F. Unit 5B (AH-E-4A)
G. Unit 5C (AH-E-7A)

Estimate total load on 1N bus cross tie

Standard: Examinee reviews steps and determines they are all in the field. Directs an Auxiliary Operator or I&C Technician to perform the steps, then signs completed by whoever was contacted. Determines an estimated load on 1N bus cross tie (zero volts).

Comment:

ICO Note:

When directed to Close 1J480V SWGR Unit 2A (substep 3), insert EVENT 3 to Delete Malfunction ED0717 and state that "1J480V SWGR Unit 2A is closed".

When directed to Close 1A Reactor Building H&V MCC Unit 1D (substep 5), state that "1D Turbine Plant MCC Unit 12D is closed".

When directed to Close 1D Turbine Plant MCC Unit 12D (substep 6), insert EVENT 4 and state that "1D Turbine Plant MCC Unit 12D is closed".

OP-TM-823-901 Step 4.2.3

Performance Step: 14

Energize 1A Reactor Bldg H&V MCC as follows:
1. Verify 1N bus cross tie load < 400 amps.
2. Verify 1J 480V BUS is energized.
3. Close 1J480V SWGR Unit 2A (feeder to 1D TP MCC.)
4. Verify load on 1J 480V bus is stable.
5. Close 1A RB H&V MCC Unit 1D
6. Close 1D Turbine Plant MCC Unit 12D

Standard:

Examinee Completes step 4.2.3 as follows:
1. Verifies no AMPS on cross tie, cross tie not used.
2. Verifies 1J 480V bus energized at PR by observing volts on 1J 480V bus
3. Orders Ron Kilby or other field operator to close 1J480V SWGR Unit 2A (feeder to 1D TP MCC.)
4. Verifies AMPs on 1N bus are still within limits (No affect crosstie not used).
5. Has operator at 1A RB close breaker.
6. Has operator at 1D TP close breaker.

Comment:

ICO Note: **Report valves closed (not modeled).**

OP-TM-823-901 Step 4.2.4.1 and 4.2.4.2

Performance Step: 15

Initiate RB cooling using industrial coolers as follows:
1. Close RB-V-73 (IB Roof)
2. Close RB-V-76 (IB Roof)

Standard:

1. Calls Field operator to close RB-V-73
2. Calls Field operator to close RB-V-76

Comment:

OP-TM-823-901 Step 4.2.4.3

√ **Performance Step: 16**
3. Start the following in fast speed:
A. AH-E-1A
B. AH-E-1B
C. AH-E-1C

Standard:
3. Starts all three AH-E-1 fans in fast by Rotating extension control clockwise and observing right most red light on. **(should not pull up on extension control)**

- AH-E-1A
- AH-E-1B
- AH-E-1C

Comment:

ICO Note: **After pump has been tested report rotation is normal.**

OP-TM-823-901 Step 4.2.4.4 and 4.2.4.5

Performance Step: 17
4. Cycle AH-P-2A to & from START and CHECK pump rotation.
5. If AH-P-2A is rotating backward…

Standard:
Rotates AH-P-2A extension control clockwise to start, verifies red light, and returns extension control to normal after stop.
Receives report from field that rotation is normal and N/A's step 4.2.4.5.

Comment:

OP-TM-823-901 Step 4.2.4.6

√ **Performance Step: 18**
6. START AH-P-2A.

Standard:
Rotates AH-P-2A extension control clockwise to start, verifies red light.

Comment:

Evaluator Note: **AH-P-10A will not immediately start when placed in Normal-After-Start.**

OP-TM-823-901 Step 4.2.4.7

√ **Performance Step: 19**

7. PLACE the following in normal-after-start.
A. AH-E-96A-EX1
B. AH-E-96B-EX1
C. AH-E-96C-EX1
D. AH-E-96D-EX1
E. AH-E-111A-EX1
F. AH-E-111B-EX1
G. AH-P-7A-EX1
H. AH-P-7B-EX1
I. AH-P-10A-EX1

Standard:

At H&V panel center places the following in normal-after -start by pressing in, rotating clockwise, and releasing:

- AH-E-96A-EX1
- AH-E-96B-EX1
- AH-E-96C-EX1
- AH-E-96D-EX1

At H&V panel side places the following in normal-after -start by pressing in, rotating clockwise, and releasing:

- AH-E-111A-EX1
- AH-E-111B-EX1

At H&V panel center places the following in normal-after -start by pressing in, rotating clockwise, and releasing:

- AH-P-7A-EX1
- AH-P-7B-EX1

At H&V panel side places the following in normal-after -start by pressing in, rotating clockwise, and releasing:

- AH-P-10A-EX1

Comment:

Terminating Cue: **When the pumps and fans listed above are in normal-after-start (step 4.2.4.7 is signed off); the JPM may be terminated.**

STOP TIME: ____________

VERIFICATION OF COMPLETION

Job Performance Measure No.: TMI 2012 NRC JPM H

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- You are the Third Reactor Operator (ARO).
- The instructor/examiner will act as the URO and CRS.
- The ICO will act as Auxiliary Operators in the plant as needed.
- Summer day outside air temperature 76°F.
- RR-P-1B is OOS for motor overhaul.
- Loss of Off Site Power has occurred.
- OP-TM-AOP-020 is complete through step 3.27.
- The 1N Cross Tie Bus is not energized.

INITIATING CUE:

The CRS has directed you to continue the actions of AOP-020 as he continues in the EOPs.

Facility:	Three Mile Island	Task No.:	73501006
Task Title:	Supply VBC from 1E Inverter	JPM No.:	2012 NRC JPM I
K/A Reference:	SYS 062 A4.01 (3.3 / 3.1)	New JPM	

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: X Actual Performance: ______

Classroom ______ Simulator ______ Plant X

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- You are the Third Reactor Operator (RO).
- The Plant is in Cold Shutdown.
- Corrective Maintenance is required on the 1C Inverter, so VBC must be transferred to the 1E inverter.
- No PM's associated with the equipment are scheduled.
- All other Vital Buses are on their normal power supply.
- The CRS has completed a pre-evolution briefing and logged it in the Control Room logbook.
- All Technical Specifications associated with this evolution have been addressed and logged.

Task Standard: All critical steps SAT

Required Materials: 1107-2B, 120 Volt Vital Electrical System, Revision 29

General References: 1107-2B, 120 Volt Vital Electrical System, Revision 29

Handout: 1107-2B, 120 Volt Vital Electrical System, Revision 29, Section 3.10, filled out through Step 3.2.3

Initiating Cue: The CRS has directed you remove VBC from service and then re-power VBC from the 1E Inverter IAW 1107-2B, 120 Volt Vital Electrical System, Section 3.10. It is not necessary for you to shutdown Inverter 1C, as another operator will be assigned that job.

Time Critical Task: N/A

Validation Time: 20 minutes

SIMULATOR SETUP:

N/A

(Denote Critical Steps with a check mark)

START TIME: ____________

Evaluator Cue: **Hand examinee 1107-2B, 120 Volt Vital Electrical System, Section 3.10.**

Evaluator Cue: **If Examinee establishes communications with the Control Room, role play as a Control Room Operator.**

Performance Step: 1 Locate 1C Inverter.

Standard: Examinee proceeds to the 1C Inverter in the East Inverter Room.

Comment:

Evaluator's Cue: **If the simulation of the breaker manipulation is completed correctly, report "The 1C Inverter output breaker to VBC is OPEN".**

Evaluator's Cue: **If the simulation of the breaker manipulation is NOT completed correctly, report "The 1C Inverter output breaker to VBC is CLOSED".**

1107-2B, Step 3.10.2.4

√ **Performance Step: 2** OPEN EE-INV-1C-IL5/2 1C Inverter Feed to VBC" ; (Key#2/5) on 1C inverter.

Standard: Examinee simulates turning the 1C Inverter Output Breaker to VBC to the OFF position.

Comment:

Procedure Note: VBC is now de-energized.

Evaluator's Cue: **When notified of the requirement for a continuous fire watch, state that a continuous Fire watch will be initiated.**

1107-2B, Step 3.10.2.5

Performance Step: 3 Within 1 Hour with backup fire suppression, COMMENCE a continuous fire watch.

Standard: Examinee notifies the Control Room to start a continuous fire watch within 1 hour.

Comment:

Procedure Note: The following is a PM to satisfy an EPRI recommendation. The breakers will be cycled when the activity is scheduled. If this activity is not scheduled, these steps may be "N/A".

Evaluator's Cue: **If asked, state "No PM's associated with the equipment are scheduled".**

1107-2B, Step 3.10.2.6

Performance Step: 4 CYCLE the breakers in VBC as follows:

Standard: This PM activity is not scheduled so the examinee should N/A the step.

Comment:

Evaluator's Cue: **If the "as found" condition is different than required, then provide the necessary feedback when the proper position is simulated selected.**

Evaluator's Cue: **TRB SW #16 and #17 are inside the cabinet. Role play as necessary.**

1107-2B, Step 3.10.2.7

Performance Step: 5 VERIFY the following breakers are Closed:
- 1B ES MCC Unit 1CR
- TRB SW #16
- TRB SW #17

Standard: Examinee verifies the following breakers are Closed:
- 1B ES MCC Unit 1CR (at 1B ES TRB FDR)
- TRB SW #16
- TRB SW #17

Comment:

Evaluator's Cue: **When contacted as the Control Room, state that all ICS/NNI stations are in AUTO.**

1107-2B, Step 3.10.2.8

Performance Step: 6 VERIFY the following ICS/NNI control stations are in Auto prior to transferring ATB to TRB.

_____ FW-V-16A
_____ FW-V-16B
_____ FW-V-17A
_____ FW-V-17B
_____ FW-P-1A
_____ FW-P-1B
_____ MS-V-3DEF/4A
_____ MS-V-3ABC/4B
_____ MU-V-17
_____ MU-V-32
_____ PZR HEATERS

Standard: Examinee contacts the Control Room to verify the required ICS/NNI stations are in AUTO.

Comment:

Procedure Note: To prevent paralleling inverters, a Kirk Key interlock has been utilized.

Evaluator's Cue: **If Bypass Source AC Input" meter V3 at 1E Inverter reads anything other than 117-123 VAC, then state that the meter reads 120 VAC.**

1107-2B, Step 3.10.2.9

Performance Step: 7 VERIFY Bypass Voltage is available at "Bypass Source AC Input" meter V3 at 1E Inverter (EE-INV-1E) as follows:

a. VERIFY Bypass Voltage reads 117-123 VAC.

b. If voltage is out-of-tolerance, then CORRECT voltage to band before static switch operation, or OBTAIN SM approval to transfer ATB to TRB.

Standard: Examinee verifies Bypass Voltage reads 117-123 VAC.

Comment:

Evaluator's Cue: **When the key is simulated turned correctly, state that the key has been repositioned.**

1107-2B, Step 3.10.2.10

√ **Performance Step: 8** Manually TRANSFER the 1E Inverter static switch by turning key IL1 "ATB Manual Transfer to TRB" counter clockwise.

- This should transfer ATB to TRB.

Standard: Examinee simulates turning key IL1 "ATB Manual Transfer to TRB" counter clockwise.

Comment:

Evaluator's Cue: **When required, inform candidate that the "TRB ALTERNATE SOURCE" light is bright.**

1107-2B, Step 3.10.2.11

Performance Step: 9 VERIFY that the "TRB ALTERNATE SOURCE" light energizes.

Standard: Examinee verifies that the "TRB ALTERNATE SOURCE" light is lit.

Comment:

Evaluator's Cue: **When required, inform candidate that the "1E INVERTER PRIMARY SOURCE" light is not illuminated.**

1107-2B, Step 3.10.2.12

Performance Step: 10 VERIFY the "1E INVERTER PRIMARY SOURCE" light de-energizes.

Standard: Examinee verifies the "1E INVERTER PRIMARY SOURCE" light is not lit.

Comment:

Evaluator's Cue: **When the key is simulated to IL2/1 correctly, state that the key has been repositioned.**

1107-2B, Step 3.10.2.13

√ **Performance Step: 11** TRANSFER Key 1 from IL1 to IL2/1 on 1E inverter.

Standard: Examinee simulates transferring Key 1 from IL1 to IL2/1 on 1E inverter.

Comment:

Evaluator's Cue: **When EE-INV-1E-IL2/1 is simulated open, state that EE-INV-1E-IL2/1 has been repositioned.**

1107-2B, Step 3.10.2.14

√ **Performance Step: 12** OPEN EE-INV-1E-IL2/1, 1E Inverter Feed to VBA/VBC (Keys 2&1) on 1E inverter.

Standard: Examinee simulates opening EE-INV-1E-IL2/1, 1E Inverter Feed to VBA/VBC (Keys 2&1) on 1E inverter.

Comment:

Evaluator's Cue: **When Key 1 is simulated rotated, state that Key 1 has been repositioned.**

1107-2B, Step 3.10.2.15

√ **Performance Step: 13** ROTATE Key 1 to lockout EE-INV-1E-IL2/1, 1E Inverter Feed to VBA/VBC (Keys 2&1).

- Key 1 is now captured.

Standard: Examinee simulates rotating Key 1 to lockout EE-INV-1E-IL2/1.

Comment:

Evaluator's Cue: **When Key 2 is simulated removed, state that Key 2 has been removed.**

1107-2B, Step 3.10.2.16

√ **Performance Step: 14** REMOVE Key 2 from IL2/1.

Standard: Examinee simulates removing Key 2 from IL2/1.

Comment:

Evaluator's Cue: **When Key 2 is simulated inserted, state that Key 2 has been inserted.**

1107-2B, Step 3.10.2.17

√ **Performance Step: 15** INSERT Key 2 into IL5 on 1C Inverter.

Standard: Examinee simulates inserting Key 2 into IL5/2 on 1C Inverter (right side).

Comment:

Evaluator's Cue: **When Key 2 is simulated rotated, state that Key 2 has been rotated.**

Evaluator's Cue: **If Key 2 is inserted into "single barrel" IL2 and the candidate simulates rotation, state "The key will not rotate".**

1107-2B, Step 3.10.2.18

√ **Performance Step: 16** ROTATE Key 2 to lock open EE-INV-1C-IL5/2, "1C Inverter Feed to VBC: (Key #2/5).

- Key 2 is now captured.

Standard: Examinee simulates rotating Key 2 to lock open EE-INV-1C-IL5/2, "1C Inverter Feed to VBC.

Comment:

Evaluator's Cue: **When Key 5 is simulated removed, state that Key 5 has been removed.**

1107-2B, Step 3.10.2.19

√ **Performance Step: 17** REMOVE Key 5.

Standard: Examinee simulates removing Key 5.

Comment:

Evaluator's Cue: **When Key 5 is simulated inserted, state that Key 5 has been inserted.**

1107-2B, Step 3.10.2.20

√ **Performance Step: 18** INSERT Key 5 into IL5.

Standard: Examinee simulates inserting Key 5 into IL5.

Comment:

Evaluator's Cue: **When Key 5 is simulated rotated, state that Key 5 has been rotated.**

1107-2B, Step 3.10.2.21

√ **Performance Step: 19** ROTATE Key 5 to open breaker lock.
- Key 5 is now captured.

Standard: Examinee simulates rotating Key 5 to open breaker lock.

Comment:

Evaluator's Cue: **When EE-INV-1C-IL5 is simulated closed, state that EE-INV-1C-IL5 has been closed.**

1107-2B, Step 3.10.2.22

√ **Performance Step: 20** CLOSE EE-INV-1C-IL5, "1E inverter feed to VBC: Key SW# 5)".
- VBC is now energized from the 1E inverter

Standard: Examinee simulates closing EE-INV-1C-IL5, "1E inverter feed to VBC.

Comment:

Terminating Cue: **After VBC is energized from the 1E inverter: This JPM is complete.**

STOP TIME: ____________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2012 NRC JPM I

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- You are the Third Reactor Operator (RO).
- The Plant is in Cold Shutdown.
- Corrective Maintenance is required on the 1C Inverter, so VBC must be transferred to the 1E inverter.
- No PM's associated with the equipment are scheduled.
- All other Vital Buses are on their normal power supply.
- The CRS has completed a pre-evolution briefing and logged it in the Control Room logbook.
- All Technical Specifications associated with this evolution have been addressed and logged.

INITIATING CUE:

The CRS has directed you remove VBC from service and then re-power VBC from the 1E Inverter IAW 1107-2B, 120 Volt Vital Electrical System, Section 3.10. It is not necessary for you to shutdown Inverter 1C, as another operator will be assigned that job.

Facility:	Three Mile Island	Task No.:	42101001
Task Title:	Place 8th Stage Heating On-Line	JPM No.:	2012 NRC JPM J
K/A Reference:	SYS 039 G2.1.30 (4.4 / 4.0)	Facility Bank JPM 099	

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: X Actual Performance: ______

Classroom ______ Simulator ______ Plant X

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- A plant startup is in progress following a maintenance outage.
- The feedwater system is "cold".
- The Auxiliary Boilers are in service at 214 psi.
- OP-TM-421-101, Condensate and Feedwater Systems – System Shutdown Mode to Plant Shutdown Mode, has directed the initiating cue.

Task Standard: All critical steps SAT

Required Materials: OP-TM-421-102, Placing 8th Stage Feedwater Heating String "A" in Service, Revision 1

General References: OP-TM-421-102, Placing 8th Stage Feedwater Heating String "A" in Service, Revision 1

Handout: OP-TM-421-102, Placing 8th Stage Feedwater Heating String "A" in Service, Revision 1, signed off through step 3.3.

Initiating Cue: Place 8th Stage Feedwater Heating String "A" in service in accordance with OP-TM-421-102, Placing 8th Stage Feedwater Heating Stage Feedwater Heating String A in Service.

Assume that you have all required equipment.

Time Critical Task: N/A

Validation Time: 15 Minutes

(Denote Critical Steps with a check mark)

START TIME: ____________

Evaluator's Cue: **Provide a copy of the procedure signed off through step 3.3.**

OP-TM-421-102, Step 4.1

Performance Step: 1 Reviews procedure.

Standard: Examinee locates OP-TM-421-102 and verifies PREREQUISITES are signed.

Comment:

Evaluator Cue: **If Examinee establishes communications with the Control Room, role play as a Control Room Operator.**

Performance Step: 2 Proceeds to the 8th stage heating panel.

Standard: Located directly north of the 8th stage heaters 4th floor turbine building.

Comment:

Evaluator's Cue: **If the "as found" condition is different than required, then provide the necessary feedback when the proper position is selected.**

OP-TM-421-102, Step 4.2

Performance Step: 3 Verify the following:

- AS-V-1A AUTO/MANUAL station is in "MANUAL" and 0 psig setting on the manual gauge.
- AS-V-1B AUTO/MANUAL station is in "MANUAL" and 0 psig setting on the manual gauge.
- Auxiliary Steam Heating Switch to "OFF" (AS-V-1114).

Standard: Examinee verifies:

- AS-V-1A and AS-V-1B AUTO/MANUAL stations in "MANUAL" with 0 psig on the manual gauge.
- Auxiliary Steam Heating Switch to "OFF" (AS-V-1114).

Comment:

Evaluator's Cue: **When sufficient and proper simulation is observed, state "The valve has stopped rotating in the counter-clockwise direction".**

Evaluator's Cue: **If insufficient or improper simulation is observed, state "The valve is not turning".**

OP-TM-421-102, Step 4.3

√ **Performance Step: 4** Open AS-V-213A.

Standard: Examinee locates and opens AS-V-213A by rotating the handwheel in the counter-clockwise direction.

Comment:

Evaluator's Cue: **When sufficient and proper simulation is observed, state "The valve has stopped rotating in the counter-clockwise direction".**

Evaluator's Cue: **If insufficient or improper simulation is observed, state "The valve is not turning".**

OP-TM-421-102, Step 4.4

√ **Performance Step: 5** Open AS-V-13A.

Standard: Examinee locates and opens AS-V-13A by rotating the handwheel in the counter-clockwise direction.

Comment:

Evaluator Cue: **When Examinee establishes communications with the Control Room, role play as a Control Room Operator.**

OP-TM-421-102, Step 4.5

Performance Step: 6 Establish communications between the CR and the Auxiliary Boiler Operator.

Standard: Examinee simulates radio contact with the Control Room.

Comment:

Evaluator's Cue: **When sufficient and proper simulation is observed, state "The valve has stopped rotating in the counter-clockwise direction".**

Evaluator's Cue: **If insufficient or improper simulation is observed, state "The valve is not turning".**

OP-TM-421-102, Step 4.6

√ **Performance Step: 7** Open CO-V-375B.

Standard: Examinee locates and opens CO-V-375B by rotating the handwheel in the counter-clockwise direction.

Comment:

Procedure Note: **Jog valves (CO-V-3B) may indicate Full Open or Full Closed with up to 10% of travel remaining. When fully opening/ closing a jog valve, depressing the OPEN/CLOSE Jog pushbutton an additional 10-15 seconds will ensure the valve is fully Open/Closed.**

Evaluator's Cue: **When contacted to close CO-V-3B, wait a minute and then report back that CO-V-3B is closed.**

Evaluator's Cue: **If the "as found" condition of CO-V-3B is different than above then provide the necessary feedback that indicated CO-V-3B is closed.**

OP-TM-421-102, Step 4.7

Performance Step: 8
- Contacts Control Room to close CO-V-3B.
- Locally verify valve closed.

Standard: Examinee locates and verifies CO-V-3B closed or describes indication that the valve is closed.

Comment:

Evaluator's Cue: **When contacted to report the position of EX-V-5A-D, report back that EX-V-5A-D are closed.**

OP-TM-421-102, Step 4.8

Performance Step: 9 Contacts control room to verify closed the following:

- EX-V-5A
- EX-V-5B
- EX-V-5C
- EX-V-5D

Standard: Examinee verifies EX-V-5A through D closed.

Comment:

Evaluator's Cue: **When the switch has been manipulated properly, point to the "On" position, and state the switch is in that position.**

OP-TM-421-102, Step 4.9

√ **Performance Step: 10** Place AS-V-1114 to ON (Auxiliary Steam Heating Switch).

Standard: Examinee selects Auxiliary Steam Heating Switch to the "ON" position.

Comment:

Evaluator's Cue: **If steam/controls alignment has been performed properly then state "the Auxiliary Boiler Operator reports that boiler steam flow is slowly rising".**

Evaluator's Cue: **If steam/controls alignment has NOT been performed properly then state "the Auxiliary Boiler Operator reports that boiler steam flow has not changed".**

OP-TM-421-102, Step 4.10

√ **Performance Step: 11** Slowly raise AS-V-1A MANUAL LOADER setting until steam flow is established.

Standard: Examinee slowly raises AS-V-1A MANUAL LOADER setting until steam flow is established and then held at that point.

Comment:

Terminating Cue: **When steam flow is established and being held, this JPM is complete.**

STOP TIME: ______________ **TIME CRITICAL STOP TIME:** ______________

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2012 NRC JPM J

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- A plant startup is in progress following a maintenance outage.
- The feedwater system is "cold".
- The Auxiliary Boilers are in service at 214 psi.
- OP-TM-421-101, Condensate and Feedwater Systems – System Shutdown Mode to Plant Shutdown Mode, has directed the initiating cue.

INITIATING CUE:

Place 8th Stage Feedwater Heating String "A" in service in accordance with OP-TM-421-102, Placing 8th Stage Feedwater Heating Stage Feedwater Heating String A in Service.

Assume that you have all required equipment.

Facility:	Three Mile Island	Task No.:	EOPG20001
Task Title:	Prepare for Transfer for RB Sump Recirculation	JPM No.:	2012 NRC JPM K
K/A Reference:	SYS 006 K4.08 (3.4 / 3.6)	Facility Bank TQ-TM-105-E10-J001	

Examinee: NRC Examiner:

Facility Evaluator: Date:

Method of testing:

Simulated Performance: X Actual Performance: ______

Classroom ______ Simulator ______ Plant X

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this Job Performance Measure will be satisfied.

Initial Conditions:

- You are the Primary Auxiliary Operator.
- The instructor/examiner will act as the Console CRO and CRS.
- A large break LOCA has occurred.
- BWST level is 40 feet and lowering at a rate of approximately one foot per minute.
- Aux Bldg sump pumps are lined up in recirculation mode.

Task Standard: All critical steps SAT

Required Materials: OP-TM-EOP-010, EMERGENCY PROCEDURE RULES, GUIDES AND GRAPHS, Guide 20, Prior to Transfer to RB Sump, Rev 12.

Locked Valve Key

General References: OP-TM-EOP-010, EMERGENCY PROCEDURE RULES, GUIDES AND GRAPHS, Guide 20, Prior to Transfer to RB Sump, Rev 12.

Handout: OP-TM-EOP-010, EMERGENCY PROCEDURE RULES, GUIDES AND GRAPHS, Guide 20, Prior to Transfer to RB Sump, Rev 12, with step 1.A filled in.

Initiating Cue: Establish communications with the Console CRO and Perform in-plant activities to support RB Sump Recirculation, IAW OP-TM-EOP-010, EMERGENCY PROCEDURE RULES, GUIDES AND GRAPHS, Guide 20".

Time Critical Task: Yes

Validation Time: 15 Minutes

(Denote Critical Steps with a check mark)

START TIME: ____________

Evaluator Note: **JPM must be completed prior to BWST level <15ft (20 mins)**

Evaluator Cue: **Provide a copy of OP-TM-EOP-010, Guide 20, with step 1.A filled in.**

Evaluator Cue: **If Examinee establishes communications with the Control Room, role play as a Control Room Operator.**

Evaluator Cue:

- **When it is determined that a Locked Valve Key is required from the Control Room, hand the candidate a simulated Locked Valve Key.**
- **When the candidate simulates inserting the key, state "the key is simulated inserted".**
- **When the candidate simulates unlocking the lock, state "the lock is simulated unlocked".**
- **When the candidate simulates closing the breaker, state "the breaker handle is in the UP position".**

OP-TM-EOP-010, Guide 20, Step 1.B.1

√ **Performance Step: 1** PERFORM the following on 1C ES Valves MCC (FHB 281: near neutralizing tank):
- UNLOCK and CLOSE Unit 3B (DH-V-2)

Standard: Examinee:

- Obtains a Locked Valve Key from the Control Room (simulated).
- Reports to 1C ES Valves MCC (Fuel Handling Building 281 level).
- Simulates unlocking Unit 3B by inserting the Locked Valve key in the lock on Unit 3B and rotating the key counter-clockwise.
- Simulates closing Unit 3B by moving the breaker handle in the upward direction.

Comment:

Evaluator's Cue:

- **When the candidate simulates closing each breaker, state "the breaker handle is in the UP position".**

Evaluator's Note:

The candidate may discuss the need for Equipment Status Tags. If this occurs, acknowledge and direct the student to carry on with the procedure.

OP-TM-EOP-010, Guide 20, Step 1.B.2,3

√ **Performance Step: 2**

PERFORM the following on 1C ES Valves MCC (FHB 281: near neutralizing tank):
- CLOSE Unit 3C (CF-V-1A)
- CLOSE Unit 4C (CF-V-1B)

Standard:

Examinee:

- Simulates closing Unit 3C by moving the breaker handle in the upward direction.
- Simulates closing Unit 4C by moving the breaker handle in the upward direction.

Comment:

Evaluator's Cue:

- **When the candidate simulates inserting the key, state "the key is simulated inserted".**
- **When the candidate simulates unlocking the lock, state "the lock is simulated unlocked".**
- **When the candidate simulates opening the valve, state "The valve has stopped rotating in the counter-clockwise direction".**
- **If insufficient or improper simulation is observed, state "The valve is not turning".**

OP-TM-EOP-010, Guide 20, Step 1.C.1

√ **Performance Step: 3**

PERFORM the following at Seal Injection Area (Aux. Bldg. 305'):
- UNLOCK and OPEN DH-V-64

Standard:

Examinee:

- Simulates unlocking DH-V-64 by inserting the Locked Valve key in the lock on DH-V-64 and rotating the key counter-clockwise.
- Simulates opening DH-V-64 by rotating the handwheel in the counter-clockwise direction.

Comment:

Evaluator's Cue:

- **When the candidate simulates inserting the key, state "the key is simulated inserted".**
- **When the candidate simulates unlocking the lock, state "the lock is simulated unlocked".**
- **When the candidate simulates closing the valve, state "The valve has stopped rotating in the clockwise direction".**
- **If insufficient or improper simulation is observed, state "The valve is not turning".**

OP-TM-EOP-010, Guide 20, Step 1.C.2

√ **Performance Step: 4**

PERFORM the following at Seal Injection Area (Aux. Bldg. 305'):
- UNLOCK and CLOSE CA-V-371 (between CA-V-2 and RB wall).

Standard:

Examinee:

- Simulates unlocking CA-V-371 by inserting the Locked Valve key in the lock on CA-V-371 and rotating the key counter-clockwise.
- Simulates closing CA-V-371 by rotating the handwheel in the clockwise direction.

Comment:

Evaluator's Cue:

- **When the candidate simulates opening the valve, state "The valve has stopped rotating in the counter-clockwise direction".**
- **If insufficient or improper simulation is observed, state "The valve is not turning".**

OP-TM-EOP-010, Guide 20, Step 1.C.3

√ **Performance Step: 5**

PERFORM the following at Seal Injection Area (Aux. Bldg. 305'):
- OPEN MU-V-198 (SI Filter bypass Valve).

Standard:

Examinee:

- Simulates opening MU-V-198 by rotating the handwheel in the counter-clockwise direction.

Comment:

Evaluator's Cue:

- **When the candidate simulates closing the valve, state "The valve has stopped rotating in the clockwise direction".**
- **If insufficient or improper simulation is observed, state "The valve is not turning".**

OP-TM-EOP-010, Guide 20, Step 1.D.1

√ **Performance Step: 6**

If the Aux Bldg sump pumps are lined up in recirculation mode, then PERFORM the following at Aux. Bldg. 281' above AB Sump:
- CLOSE WDL-V-714

Standard:

Examinee:

- Simulates closing WDL-V-714 by rotating the handwheel in the clockwise direction.

Comment:

Evaluator's Cue:

- **When the candidate simulates opening the valve, state "The valve has stopped rotating in the counter-clockwise direction".**
- **If insufficient or improper simulation is observed, state "The valve is not turning".**

OP-TM-EOP-010, Guide 20, Step 1.D.2

√ **Performance Step: 7**

If the Aux Bldg sump pumps are lined up in recirculation mode, then PERFORM the following at Aux. Bldg. 281' above AB Sump:

- OPEN WDL-V-713

Standard:

Examinee:

- Simulates opening WDL-V-713 by rotating the handwheel in the counter-clockwise direction.

Comment:

Terminating Cue: **When WDL-V-713 is simulated open, this JPM is complete.**

STOP TIME: ______________

√ Time Critical Time of JPM start ______ - Time of completion ______ = _______

Standard: Less than 20 minutes.

VERIFICATION OF COMPLETION

Job Performance Measure No.: 2012 NRC JPM K

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to Complete:

Question Documentation:

Question:

Response:

Result: SAT ______ UNSAT ______

Examiner's Signature: ______________________ Date: ______________

INITIAL CONDITIONS:

- You are the Primary Auxiliary Operator.
- The instructor/examiner will act as the Console CRO and CRS.
- A large break LOCA has occurred.
- BWST level is 40 feet and lowering at a rate of approximately one foot per minute.
- Aux Bldg sump pumps are lined up in recirculation mode.

INITIATING CUE:

Establish communications with the Console CRO and Perform in-plant activities to support RB Sump Recirculation, IAW OP-TM-EOP-010, EMERGENCY PROCEDURE RULES, GUIDES AND GRAPHS, Guide 20".

Time Critical Task: Yes

GUIDE 20
PRIOR TO TRANSFER TO RB SUMP
Page 1 of 1

IAAT HPI **or** LPI are actuated, **then** perform the following:

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
___ 1. **OBSERVE** the rate of BWST level reduction **and ENSURE** the following actions prior to BWST level < 15 ft: A. **ENSURE** the following lights Off: ___ DH-V-6A DISABLED PB ___ DH-V-6B DISABLED PB B. **PERFORM** the following on 1C ES Valves MCC (FHB 281: near neutralizing tank): ___ **UNLOCK** and **CLOSE** Unit 3B (DH-V-2) ___ **CLOSE** Unit 3C (CF-V-1A) ___ **CLOSE** Unit 4C (CF-V-1B) C. **PERFORM** the following at Seal Injection Area (Aux. Bldg. 305'): ___ **UNLOCK and OPEN** DH-V-64 ___ **UNLOCK and CLOSE** CA-V-371 (between CA-V-2 and RB wall). ___ **OPEN** MU-V-198 (SI Filter bypass Valve). D. **If** the Aux Bldg sump pumps are lined up in recirculation mode, **then PERFORM** the following at Aux. Bldg. 281' above AB Sump: ___ **CLOSE** WDL-V-714 ___ **OPEN** WDL-V-713	
___ 2. **When** BWST Level < 15 feet, **then VERIFY** HPI is Shutdown **or** placed in "piggyback" mode IAW OP-TM-211-901 "Emergency Injection HPI/LPI" Section 4.3.	

Facility:	Three Mile Island	Scenario No.:	1	Op Test No.:	10-02 NRC
Examiners:			Operators:		

Initial Conditions:

- (Temporary IC-231)
- 100% Power, MOL
- MO-P-1C and MO-P-1F are OFF for Chemistry purposes IAW OP-TM-431-403/406
- Crane work is occurring on the West side of the Plant to stage new piping

Turnover: Maintain 100% Reactor Power

Critical Tasks:

- Control SG Pressure (adjust TBVs/ADVs) to: Maintain RC Temperature Constant or Maintain Appropriate Pri-Sec ΔT/Cooldown Rate (CT-11)
- Isolate Overcooling SG(s) (CT-17)
- Control RCS Inventory (CT-30)

Event No.	Malf. No.	Event Type*	Event Description
1	RW02C	TS CRS C ARO	NR-P-1C Trips, NR-P-1B Fails to Auto-Start, entry into OP-TM-MAP-B0105, and OP-TM-MAP-B0205 (ARO: Starts NR-P-1B from CR)
2	ED22G	I CRS I ARO	ICS Auto Power ICCW Subfeed Failure, entry into OP-TM-MAP-H-0108 (ARO: Restores Letdown following a Loss of ICS AUTO Power)
3	EGR30	TS CRS R URO	Loss of EG-Y-1A Starting Air, entry into OP-TM-MAP-A0102, and OP-TM-MAP-A0201 (URO: Reduce Reactor Power)
4	IC09 IC53	I CRS I URO I ARO	MW Generated Input Fails to Zero Volts, entry into OP-TM-AOP-070 (URO/ARO: Control ICS in Manual IAW AOP-070)
5	ED12 ED13	C CRS C URO C ARO	Loss of ICS Hand and Auto Power, entry into OP-TM-AOP-025, and OP-TM-EOP-001 (URO: Reactor Trip IMA's, ARO: Control OTSG Pressures)
6	FW09A	M CRS M URO M ARO	FW Line Break Inside RB, Excessive Heat Transfer, entry into OP-TM-EOP-003.
7	ZDISSM UV37(1)	C CRS C URO	MU-V-37 Fails Closed (URO: Throttle an MU-V-16 for minimum MU flow)

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Three Mile Island NRC Scenario #1

Event #1: When the crew has accepted the watch, the Lead Examiner will cue trip of the "C" Nuclear River Pump. "B" Nuclear River Pump fails to auto-start in standby, leaving only one (1) nuclear River Pump running. One Nuclear River Pump may not be sufficient to cool both the Nuclear Service Closed Cooling System (NSCCW) and the Intermediate Closed Cooling System (ICCW).

It is considered a loss of NSCCW if NSCCW temperatures reach 100F, and the following Critical Safety Functions are affected:

> **CSF 4**, Core Heat Removal: Provide the capability to remove core heat production at all times: Loss of Nuclear Services cooling function: RC pumps must shutdown. Natural Circulation will be used RCS heat removal.
> **CSF 8**, Auxiliary Emergency Systems: Provide equipment cooling (closed cooling and ventilation), and other support requirements to accomplish the other Critical Safety Functions. Provide Instrument Air for operation of EFW, ADVs, RCP Support Systems, and some containment isolation valves: Loss of Nuclear Services cooling function: Other CSFs are affected as follows: (1) the reliability of safety related power sources and instrumentation system is degraded by the loss of the control building chillers and (2) the reliability of the decay closed pump motors and emergency feed pump motors is degraded by the loss of cooling to the area ventilation coolers.
> **CSF 10**, Chemistry Control: Provide the means to monitor and control primary and secondary water chemistry in order to ensure the long term reliability of plant systems and limit the potential release of radioactive materials: Loss of Nuclear Services cooling function would result in the loss of the capability to obtain an RCS or OTSG sample.

It is considered a loss of ICCW if ICCW temperatures reach 120°F, and the following Critical Safety Functions are affected:

> **CSF 1**, Reactivity and Reactor Power Control: Maintain control of the fission process, maintain the capability to shutdown the reactor and the capability to maintain the reactor in a shutdown condition. Control energy production and reactor power distribution based on design limits and current core heat removal capability. Loss of Intermediate Component Cooling: The reactor is tripped in the event of loss of cooling to the CRD stators in order to prevent stator damage. Loss of CRD stator cooling would not prevent CRD insertion on RPS actuation. Maintaining reactor shutdown is not affected by loss of IC component cooling.
> **CSF 3**, RCS Integrity: Maintain the capability to control heatup and cooldown rates and control RCS pressure prevent reactor vessel brittle fracture or LTOP events. Maintain RCP seal cooling to prevent excessive loss of RCS inventory through RCP seals. Loss of Intermediate Component Cooling: One of two RCP seal cooling methods is lost. Loss of seal injection would require RCP shutdown. If SI is lost, overheating of RCP seals is likely. If seal injection maintained, solid operation may be required due to the loss of letdown.

The crew will diagnose the trip of NR-P-1C by an amber disagreement light on the NR-P-1C control switch and Annunciator alarms A-1-5 and A-2-5. The ARO will manually start "B" Nuclear River Pump to provide sufficient cooling for NSCCW and ICCW. The CRS will identify and declare the following Tech Spec: 3.3.2.

When NR-P-1B is running and the Tech Spec has been declared, the scenario can continue.

Event #2: The Lead Examiner will cue the ICS Auto Power ICCW Subfeed Failure. A loss of letdown will occur based on a loss of ICS AUTO Subfeed, and the following Critical Safety Functions are affected:

> **CSF 2**, Reactor Vessel Inventory Control: Provide the means to maintain the core covered with sub cooled water. Loss of ATA or ICS auto power: Letdown is isolated by closure of MU-V-3, MU-V-1A and MU-V-1B. Letdown can be recovered when resources are available. Lifted leads are required to remotely operate MU-V-1A/B and MU-V-3. MU-V-17 in HAND will be used to control pressurizer level. RC-LI-777 is the only pressurizer level indication available.
> **CSF 8**, Auxiliary Emergency Systems: Provide equipment cooling (closed cooling and ventilation), and other support requirements to accomplish the other Critical Safety Functions. Provide Instrument Air for operation of EFW, ADVs, RCP Support Systems and some containment isolation valves. Loss of ATA or ICS auto power: Safety related ventilation and component cooling is not adversely affected. Flow and temperature indications for ICCW system are lost. ICCW cooling should remain adequate. Isolation of letdown will reduce ICCW temperature.

The crew will diagnose the loss of ICCW AUTO Subfeed by Annunciator C-1-2 and H-1-8 in alarm, ICS Subfeed light not lit on Panel Center, multiple ICCW indications failed mid-scale, and/or MU-V-1A/B and MU-V-3 closed. The ARO will restore letdown IAW OP-TM-211-950 (performing the appropriate portion of the procedure when restoring from isolation following a loss of ICS AUTO Power).

Once Letdown is restored, the scenario can continue.

Event #3: The Lead Examiner will cue the loss of EG-Y-1A Starting Air. This will prevent Emergency Diesel Generator, EG-Y-1A, from being able to start. If normal power to the D 4kV bus is lost, the following Critical Safety Functions are affected:

> **CSF 9**, Fire Protection & Remote Shutdown Capability: Maintain means to prevent, detect and suppress fires, as well as the capability to perform a plant shutdown without access to the Control Room. Loss of 1D 4160V bus: Relay room cardox and IPSH detection systems are inoperable. Fire watches are initiated.
> All other Critical Safety Functions are affected by a loss of 1D 4kV, but the redundent train, powered by 1E 4kV would provide sufficient backup.

The crew will diagnose a loss of EG-Y-1A Starting Air by annunciator A-2-1 and A-1-2 in alarm and communications with the Auxiliary Operators. The CRS will identify and declare Tech Spec 3.7.2.c, which states that since an Emergency Diesel is not operable on ES Train A, and a Nuclear River Pump is not operable on ES Train B, a 3.0.1 Timeclock is in effect (1 Hour to fix or commence a reactor shutdown). The crew will brief and commence a reactor shutdown IAW 1102-4, Power Operations.

This is the reactivity manipulation for the scenario.

When the Tech Spec has been declared and sufficient reactivity manipulation has been observed, the scenario can continue.

Event #4: The Lead Examiner will cue MW Generated Input Failing to Zero Volts. This will cause an ICS transient, which if not responded to swiftly, will cause a Reactor Trip. The crew will diagnose the ICS failure by a rapid change in RCS pressure, Reactor Power rising, multiple annunciator alarms, and/or changes in indications at multiple ICS stations. Entry into OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET will be required based on RCS pressure not being controlled in ICS AUTO.

> "RCS pressure is not being controlled" requires the operator to make a subjective determination, based on their skills, training, and experience. A determination that RCS pressure is being controlled should include the following elements: 1) The reason for the transient is understood 2) RCS pressure response is consistent with the expected response for the event 3) Automatic or manual control in accordance with normal operating procedures is effectively controlling RCS pressure. A conservative assessment (i.e. concluding that RCS pressure is not being controlled) is appropriate when the three conditions above cannot be satisfied. ICS failures are one class of events that can lead to an upset in primary to secondary heat transfer. Most ICS failures can be mitigated by use of the appropriate manual control normal operating procedures.

This entry into AOP-070 is unique from the other scenarios because Reactor Power will rise and the URO will have to insert rods in manual to maintain Reactor Power less than 100%.

Once the plant is stabilized in ICS HAND control, the scenario can continue.

Event #5: The Lead Examiner will cue the loss of ICS Hand and Auto Power. The following Critical Safety Functions are affected:

> **CSF 1**, Reactivity and Reactor Power Control: Maintain control of the fission process, maintain the capability to shutdown the reactor and the capability to maintain the reactor in a shutdown condition. Control energy production and reactor power distribution based on design limits and current core heat removal capability. **Loss of ICS hand and auto power:** In the event of loss of Hand and Auto power the reactor will be tripped. The ability to recognize this condition is enhanced by the loss of ICS power indicators on PCL and alarm H-1-8. The RPS function is not affected.

CSF 3, RCS Integrity: Maintain the capability to control heatup and cooldown rates and control RCS pressure prevent reactor vessel brittle fracture or LTOP events. Maintain RCP seal cooling to prevent excessive loss of RCS inventory through RCP seals. **Loss of ICS hand and auto power:** Automatic control of RCS pressure is lost. Manual operation of bank 4 and bank 5 heaters, manual operation of spray, and manual operation of the PORV are available. Tavg and most RCS temperature indication are lost. THOT and TCOLD on PCL and incore thermocouples are available. Loss of automatic PORV operation degrades LTOP protection.

CSF 4, Core Heat Removal: Provide the capability to remove core heat production at all times. **Loss of ICS hand and auto power:** Loss of control of Main FW pump speed and FW valve position will result in FW flow approximately equal to 100% power condition. The reactor and both Main FW pumps will be tripped and forced RCS circulation with OTSG heat removal will be maintained using EFW and ADVs. Local TBV operation may be used to conserve secondary inventory.

The crew will diagnose a loss of ICS Hand and Auto Power by ICS AUTO Available and ICS HAND Available lights not lit on PC, and/or all ICS powered indications either not lit or mid-scale throughout the Control Room. The CRS will enter OP-TM-AOP-025, LOSS OF ICS HAND AND AUTO POWER. The URO will perform the Immediate Manual Actions of OP-TM-EOP-001, REACTOR TRIP to trip the reactor. The ARO will control OTSG pressure with the Atmospheric Dump Valves on the Backup Loader.

Once the reactor is tripped, a symptom check is performed, and the OTSG pressures are being controlled sufficiently on the Atmospheric Dump Valves, then the scenario can continue.

Event #6/7: The lead examiner will cue the FW Line Break inside RB, causing excessive heat transfer. An excessive heat transfer event is a challenge to the reactor coolant system pressure boundary. This fission product barrier challenge is greatest if RCS pressure is not controlled when the cooldown is terminated. The sequenced priorities of mitigation are:

- Stop excessive primary-to-secondary heat transfer,
- Restore controlled primary-to-secondary heat transfer,
- Stabilize RCS pressure and temperature,
- Route appropriately to "HPI Cooling" if both OTSGs are impacted.

Immediate action is initiated to terminate the overcooling and ensure pressurizer level is maintained. Loss of pressurizer inventory may result in a loss of SCM or less severe challenges to RCS pressure control. Isolating feedwater to the affected OTSG terminates excessive primary to secondary heat transfer. Isolating steam paths may further limit the overcooling or may allow continued use of the OTSG for plant cooldown. Control of RCS pressure after terminating an overcooling is dependent upon two independent actions (1) steaming the unaffected OTSG to prevent RCS temperature rise, and (2) throttle/terminate MU/HPI avoid raising pressurizer level above the desired post trip band (~ 100")

The crew will diagnose the excessive heat transfer based on all of the following conditions existing:

- RCS average temperature is below 540 °F,
- Uncontrolled lowering of RCS temperature,
- Tsat for OTSG pressure is less than Tcold for the affected OTSG(s),

and enter OP-TM-EOP-003, EXCESSIVE PRIMARY TO SECONDARY HEAT TRANSFER. The ARO will isolate the "A" OTSG using Rule 3. Once the "A" OTSG is isolated, the URO will terminate HPI IAW Rule 2.

Makeup Pump minimum Recirc Valve, MU-V-37, will fail to open, and the URO will be required to maintain minimum Makeup flow via alternative methods IAW Rule 2.

The scenario may be terminated when the "A" OTSG is isolated, HPI flow is terminated, and minimum Makeup flow is established.

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-11 - Control SG Pressure (adjust TBVs/ADVs) to: Maintain RC Temperature Constant or Maintain Appropriate Pri-Sec ΔT/Cooldown Rate - This is a critical task in that poor steam pressure control immediately following reactor trip will cause continued excessive RCS cooling to occur. This would significantly change the mitigation strategy of the event

- Critical task (CT-11) is to control Pri-Sec ΔT/Cooldown Rate via the Turbine Bypass Valves or Atmospheric Dump Valves manually. Alternately if the TBV's/ADV's are left in automatic, excessive RCS cooling may occur due to poor steam pressure control immediately following a reactor trip. An uncontrolled cooldown condition should be considered grounds for failure of the critical task.

Safety Significance: Following a reactor trip, SG pressures should be controlled using the TBVs/ADVs to prevent initial RCS cooldown. In the event that Heat Sink Protection System actuation is necessary the operator provides appropriate operation of this system for its control and plant stabilization. Proper control of SG pressures leads to enhanced transient mitigation capability of the plant as normal heat removal systems remain available.

Cues:

1. SPDS displays and associated alarms
2. P-T display and associated alarms
3. HSPS and associated alarms

Performance Indicators:

1. Operation of TBV/ADV controls
2. Operation of HSPS controls

Feedback:

1. RC temperature and pressure
2. SG level and pressure
3. MSSV status indication

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-17 - Isolate Overcooling SGs - This is a critical task in that continued feeding of an OTSG with a steam break will continue to overcool the RCS, which could result in emptying the Pressurizer and causing a loss of subcooling margin. This would significantly change the mitigation strategy of the event

- Critical task (CT-17) is to isolate the affected OTSG prior to emptying the, pressurizer. Alternately if HPI held pressurizer level, cooldown below 329°F with HPI on would violate TS. Either condition should be considered grounds for failing critical task.

Safety Significance: If the overcooling SG has been identified then that SG should be isolated, otherwise both SGs should be isolated. Isolating a SG means to stop all FW flow (MFW and AFW) and steam flow (e.g., close TBVs, ADVs, steam supply to FW pumps, MSIVs etc.). FW flow should be maintained to the unaffected SG and cooling stabilized using the unaffected SG.
Isolation of a SG or both SGs should always follow a logical progression of increasingly more drastic attempts to isolate the SG. For example, if the overcooling is not severe it may be possible to close both the TBVs and ADVs as well as the auxiliary steam valves thus isolating the SG. If this does not work, then for those plants which have main steam isolation valves, the main steam isolation valve should then be closed. For severe overcooling situations, [secondary plant protection system] will likely actuate. Inappropriate mitigative actions can cause loss of both SGs even if only one SG is faulted; such a situation would cause degradation of the transient mitigation capability of the plant.

Cues:
1. SPDS displays and associated alarms
2. P-T display and associated alarms
3. Rising RB Pressure and Temperature
4. RB Fire/Heat alarms

Performance Indicators:
1. Operation of HIPI/MU pump start switches
2. Operation of associated FW pump and valve controls (affected OTSG)
3. Operation of associated steam valve (included TBVs/ADVs) controls (affected OTSG)
4. Operation of MSIV's (affected OTSG)

Feedback:
1. RC temperature and pressure
2. SG level and pressure
3. MSIV status indication
4. MFW/AFW pump and valve status indications

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-30 – Control RCS Inventory - This is a critical task in that Makeup flow and/or High Pressure Injection flow must be properly utilized to Control RCS inventory. Any unnecessary excessive subcooling condition or thermal cycling of HPI nozzles would significantly change the mitigation strategy of the event

- Critical task (CT-30) is to control RCS inventory prior to emptying the pressurizer while not creating an excessive subcooling condition. Once an Excessive Heat Transfer condition no longer exists, pressurizer level is adjusted with MU (maintaining a minimum for pump damage concerns); HPI is not needed and can complicate achieving stability and cause unnecessary HPI nozzle thermal cycles. Either condition should be considered grounds for failing critical task.

Safety Significance: During XHT mitigation, the XHT will contract the RCS inventory. This CT covers actions to be taken to reduce the pressurizer level drop by normal means such as maximizing makeup flow and minimizing RCS letdown flow. If these actions are unsuccessful in keeping the pressurizer level from decreasing to the [low level] setpoint, then HPI should be used. HPI is not normally used post-trip to counter the expected pressurizer level change due to excessive thermal cycling of the HPI nozzles and to prevent possible subsequent complications if excessive inventory is added. HPI is used if necessary to try and maintain pressurizer level on-scale and prevent the surge line from draining. Efforts to maintain pressurizer level should be controlled to not result in excessive subcooling, especially if HPI is used. Once the transient has been terminated and controlled heat removal has been established, RCS inventory control can be stabilized and, if applicable, letdown can be reestablished.

Cues:
1. SPDS displays and associated alarms
2. P-T display and associated alarms
3. SCM monitor and associated alarms
4. Pressurizer Low and Lo-Lo- alarms

Performance Indicators:
1. Operation of MU system valve controls
2. Operation of MU system pump controls
3. Operation of letdown valve controls
4. Operation of HPI valve controls
5. Operation of HPI pump controls

Feedback:
1. Pressurizer level
2. SCM
3. Letdown flow
4. MU flow
5. HPI flow

Industry Experience:

- Nine Mile Point – Manual Reactor Scram Inserted Due to a Feedwater Leak on a Min Flow Line (Event # 47141) (8/11/11)
- Three Mile Island – TMI-1 Loss of ICS/NNI Power (OE1615) (1/29/86)

PRA

- Diesel Generator 1A loss (Risk Increase Factor)
- Secondary Line Breaks (Initiating Event)

Event	Description	Procedure Support
	Initial Set-up.	100% Power, MOL
1	NR-P-1C Trips, NR-P-1B Fails to Auto-Start	OP-TM-MAP-B0105, 480V ES MOTOR TRIP
		OP-TM-MAP-B0205, 480V ES MOTOR OVERLOAD
		Technical Specifications
2	ICS Auto Power ICCW Subfeed Failure	OP-TM-MAP-H-0108, ICS/NNI POWER LOST
3	Loss of EG-Y-1A Starting Air	OP-TM-MAP-A0102, DIESEL GEN 1A TROUBLE
		OP-TM-MAP-A0201, DIESEL GEN 1A BLOCKED
		Technical Specifications
4	MW Generated Input Fails to Zero Volts, entry into	OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET
		1102-4 Power Operations
5	Loss of ICS Hand and Auto Power	OP-TM-AOP-025, LOSS OF ICS HAND AND AUTO POWER
		OP-TM-EOP-001, Reactor Trip
6	FW Line Break Inside RB, Excessive Heat Transfer	OP-TM-EOP-003, Excessive Primary To Secondary Heat Transfer
		OP-TM-EOP-010, Emergency Procedure Rules, Guides and Graphs
7	MU-V-37 Fails Closed	OP-TM-EOP-010, Emergency Procedure Rules, Guides and Graphs

Scenario Set-up
NRC Scenario 1

ACTION	COMMENTS / INSTRUCTIONS	DESCRIPTION
Initialization IC-231	100% HFP ICS full AUTO	Equilibrium XENON
Override 03A6S25-ZDINRP1BT(3)	Value: OFF When: Immediately	NR-P-1B Fails to Auto Start
Malfunction IC53	Value: Insert When: Immediately	SASS Channel Failure – Generated MW
Remote MSR67	Value: 1006 When: Immediately	MSSV Reseat Pressure High
Remote MSR68	Value: 1006 When: Immediately	MSSV Reseat Pressure High
Malfunction RW02C	Value: Insert When: Event 1	NR-P-1C Trips
Malfunction ED22G	Value: Insert When: Event 2	ICS AUTO Pwr Subfeed Failure - ICCW
Remote EGR30	Value: Close When: Event 3	EG-V-15A Closes
Malfunction IC09	Value: Insert When: Event 4	Generated MW Input Fails to Zero Volts
Malfunction ED12	Value: Insert When: Event 5	Loss of ICS HAND and AUTO Power
Malfunction ED13	Value: Insert When: Event 5	Loss of ICS HAND and AUTO Power
Malfunction FW09A	Value: 100, 240 Ramp When: Event 6	FW Line Break in RB
Trigger #7	Value: Insert When: dhndhp1a > 0.9	MU-V-37 Fails Closed
Override 02A5S80-ZDISSMUV37(1)	Value: On When: Event 7	MU-V-37 Fails Closed
Remote MUR59	Value: Lifted When: Event 10	Lifted Leads for MU-V-1A/B
Remote MUR60	Value: Lifted When: Event 11	Lifted Leads for MU-V-3

Op Test No.:	1	Scenario #	1	Event #	1	Page	13 of 31
Event Description:	NR-P-1C Trips, NR-P-1B Fails to Auto-Start (TS)						

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 1**
Indications Available:		**MAP B-1-5 and B-2-5 in alarm, NR-P-1C amber disagreement light lit on CR, PPC alarm.**
EXAMINER'S NOTE:		**Crew may decide to start NR-P-1B upon discovery of it not auto-starting IAW OS-24.**
Booth Operator Cue:		**If directed, as an Auxiliary Operator and/or Maintenance, to investigate NR-P-1C and it's breaker, acknowledge the order. Nothing will be found at the pump or breaker.**
Booth Operator Cue:		**If directed, as an Auxiliary Operator and/or Maintenance, to ES select NR-P-1B on the 1T 480V bus, delay a call back until cued in a future event.**
	CRS	Direct entry into OP-TM-MAP-B0105, 480V ES MOTOR TRIP
		OP-TM-MAP-B0105, 480V ES MOTOR TRIP
	ARO	ARO should diagnose the trip of NR-P-1C and the failure of NR-P-1B to automatically start on standby.
EXAMINER'S NOTE:		**OP-TM-MAP-B0105, Step 1 is N/A**
	ARO	Step 2: Starts NR-P-1B by turning the Control Switch (CR) clockwise, observing red indicating light and normal running amps after initial start.
EXAMINER'S NOTE:		**The crew may match flags for NR-P-1C (place pump in Off or Pull-to-Lock to clear overhead alarm.** **The crew may also utilize OP-TM-541-452, Remove NR-P-1C From Service, which provides direction to ES select NR-P-1B on the 1T 480V bus and also to close NR-V-1C.**

Op Test No.: 1	Scenario # 1	Event # 1	Page 14 of 31

Event Description: NR-P-1C Trips, NR-P-1B Fails to Auto-Start (TS)

Time	Position	Applicant's Actions or Behavior
EXAMINER'S NOTE:		**OP-TM-MAP-B0105, Steps 3 and 4 are N/A**
	ARO	Step 5: Recognizes that NR header pressure is within the acceptable pressure band.
EXAMINER'S NOTE:		**OP-TM-MAP-B0105, Step 6 is N/A**
	CRS	Step 7: Declares a 3.3.2 (72 Hour) Tech Spec clock.
EXAMINER'S NOTE:		**T.S. 3.3.2 Maintenance or testing shall be allowed during reactor operation on any component(s) in the makeup and purification, decay heat, RB emergency cooling water, RB spray, BWST level instrumentation, or cooling water systems which will not remove more than one train of each system from service. Components shall not be removed from service so that the affected system train is inoperable for more than 72 consecutive hours. If the system is not restored to meet the requirements of Specification 3.3.1 within 72 hours, the reactor shall be placed in a HOT SHUTDOWN condition within six hours.***
EXAMINER'S NOTE:		**Once the TS call is made, NR-P-1B is operating and the order has been directed to ES select NR-P-1B, Go to Event 2.**

Op Test No.:	1	Scenario #	1	Event #	2	Page	15 of 31
Event Description:	ICS Auto Power ICCW Subfeed Failure						

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 2**
Indications Available:		**MAP C-1-2 and C-1-3 in alarm, Subfeed light not illuminated (PC), ICCW indications at mid-scale.**
Booth Operator Cue:		**If directed, as an Auxiliary Operator and/or Maintenance, to investigate which ICS subfeed has been lost at the ICS Power Monitor Panel, report back that " the ICCW AUTO subfeed light is out, all other subfeed lights are lit".**
	Crew	Diagnoses a loss of ICCW AUTO Subfeed.
	CRS	Direct entry into OP-TM-MAP-H0108, ICS/NNI POWER LOST
		OP-TM-MAP-H0108, ICS/NNI POWER LOST
	CRS	Step 4.0: Goes to OP-TM-AOP-027, Loss of ATA or ICS/NNI Auto Power
EXAMINER'S NOTE:		**OP-TM-AOP-027 is not entered in its entirety since the entry conditions are not fully met. It is used only as a reference for the affected subfeed.** **The CRS may also decide on using "approaching" criteria to enter MAP G-2-5 or D-2-3 for direction to restore letdown.**
		OP-TM-AOP-027, Loss of ATA or ICS/NNI Auto Power
	ARO	Step 3.11: Initiates OP-TM-211-950 "Restoration Of Letdown Flow".
		OP-TM-211-950, Restoration of Letdown Flow
	ARO	Reviews Precautions, Limitations, and Prerequisites.

Op Test No.:	1	Scenario #	1	Event #	2	Page	16 of 31
Event Description:	ICS Auto Power ICCW Subfeed Failure						

Time	Position	Applicant's Actions or Behavior
Booth Operator Cue:		**If directed as an Auxiliary Operator to report Local ICCW cooler outlet temperature, respond "Local ICCW cooler outlet temperature < 100°F". There is no Local ICCW Flow indicator, so if directed to report Local ICCW cooler outlet temperature, respond that you cannot find an indicator for ICCW flow.**
EXAMINER'S NOTE:		**OP-TM-211-950 Step 3.3.1 states to Verify ICCW flow >550gpm. With ICS power to the indicator lost, the crew will need to display proper Engaged Thinking Skills to determine that flow has not changed (SOER 10-2)**
EXAMINER'S NOTE:		**OP-TM-211-950, Steps 4.1-4.3 are N/A.**
	CRS	Step 4.4.1: Decides that ICS AUTO power is deenergized and obtains Shift Manager concurrence to lift leads.
EXAMINER'S NOTE:		**Role Play as Shift Manager and give concurrence to restore letdown.**
	ARO	Step 4.4.2: Directs an Auxiliary Operator to disconnect lead 7-3-3-16 in the ICS/NNI cabinet.
Booth Operator Cue:		**When directed as an Auxiliary Operator (or I&C Technician) to disconnect lead 7-3-3-16 in the ICS/NNI cabinet, insert EVENT #10 and report back that lead 7-3-3-16 in the ICS/NNI cabinet is disconnected and, if applicable, that another Auxiliary Operator (or I&C Technician) has performed the Concurrent Verification.**
EXAMINER'S NOTE:		**The crew may decide that Step 4.4.3 does not need to be performed because this partial loss of AUTO power has not affected MU-V-3 operations, and perform a Partial Performance of OP-TM-211-901.**

Op Test No.: 1	Scenario # 1	Event # 2	Page 17 of 31				
Event Description:	ICS Auto Power ICCW Subfeed Failure						

Time	Position	Applicant's Actions or Behavior
	ARO	Step 4.4.3: Directs an Auxiliary Operator to disconnect lead 5-4-5-4 in the ICS/NNI cabinet.
Booth Operator Cue:		**If directed as an Auxiliary Operator (or I&C Technician) to disconnect lead 5-4-5-4 in the ICS/NNI cabinet, insert EVENT #11 and report back that lead 5-4-5-4 in the ICS/NNI cabinet is disconnected and, if applicable, that another Auxiliary Operator (or I&C Technician) has performed the Concurrent Verification.**
EXAMINER'S NOTE:		**OP-TM-211-950, Step 4.4.4 is N/A.**
	ARO	Step 4.5: Verifies MU-V-5 is closed by the Control Station demand indicator reading zero (CC), closes MU-V-3 and MU-V-4, verifying green closed lights lit and the red open lights not lit (CC).
	ARO	Step 4.6: Ensures MU-V-1A and MU-V-1B are open by pressing the open pushbuttons and verifying the red open lights are lit and the green closed lights are not lit (CC).
	ARO	Step 4.7.2: Verifies MU-V-2A and MU-V-2B are open by the red open lights are lit and the green closed lights are not lit (CC and PCR).
	ARO	Step 4.8.2: Throttles MU-V-5 to 10% open by operating the dial on the MU-V-5 Control Station to the 10 position.
	ARO	Step 4.9: Determines MU-V-8 is aligned to the THRU position by the indication THRU TO FILTERS lit and BYPASS indication not lit (CC)
	ARO	Step 4.10.4: Opens MU-V-3 by pressing the open pushbutton and observing the red open light lit and the green closed light not lit (CC)
EXAMINER'S NOTE:		**Once letdown is restored, Go to Event 3.**

Op Test No.:	1	Scenario #	1	Event #	3	Page	18 of 31
Event Description:	Failure of EG-V-15A Air						

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner, INITIATE Event 3.**
Indications Available:		**MAP A-1-2 and A-2-1 in alarm.**
Booth Operator Cue:		**If directed as an Auxiliary Operator to investigate EG-Y-1A, pause briefly, then report back "There is no air pressure indicated for either receiver", and "There is a break in the starting air line".**
	Crew	Diagnoses via communications with the Auxiliary Operators that there is no starting air for EG-Y-1A.
EXAMINER'S NOTE:		**OP-TM-MAP-A0201 does not have steps to fix the issue and Maintenance will need to be called to fix the problem.**
	CRS	Directs entry into OP-TM-MAP-A0201, DIESEL GEN 1A BLOCKED
Booth Operator Cue:		**If direction had gone out to ES select NR-P-1B, report that "The ES selector switch on 1T 480V bus has broken off in my hand as I was manipulating it. I am unable to determine which Nuclear River Pump is selected".** **If no direction had gone out to ES select NR-P-1B, report that "On my rounds, I found the 1T 480V bus Nuclear River ES selector switch broken on the floor. I am unable to determine which Nuclear River Pump is selected on the 1T 480V bus".**
EXAMINER'S NOTE:		**The crew will have to determine that NR-P-1C is still ES selected on the 1T 480V bus by observing the status of NR-P-1B and NR-P-1C on the ES status Panel (PCR).**
	CRS	Declares a 3.7.2.c (1 Hour) Tech Spec clock and gives a crew brief on a reactor shutdown.

Op Test No.:	1	Scenario #	1	Event #	3	Page	19	of 31
Event Description:		Failure of EG-V-15A Air						

Time	Position	Applicant's Actions or Behavior
EXAMINER'S NOTE:		**T.S. 3.7.2.c Both diesel generators shall be operable except that from the date that one of the diesel generators is made or found to be inoperable for any reason, reactor operation is permissible for the succeeding seven days* provided that the redundant diesel generator is:** **1. verified to be operable immediately;** **2. within 24 hours, either:** **a. determine the redundant diesel generator is not inoperable due to a common mode failure; or,** **b. test redundant diesel generator in accordance with surveillance requirement 4.6.1.a.** **With one diesel generator inoperable, in addition to the above, verify that: All required systems, subsystems, trains, components and devices that depend on the remaining OPERABLE diesel generator as a source of emergency power are also OPERABLE or follow specifications 3.0.1.**
		1102-4, Power Operations
	URO	Step 3.3.2.2.b).2: Sets ULD LOAD RATE OF CHANGE to either 1 or 3 %/minute, as determined by CRS by rotating the Dial on the ULD Load Rate of Change ICS Station counter-clockwise to either 10 (for 1%/min) or 30 (for 3%/min). Obtains CRS verification of setpoint.
	URO	Step 3.3.2.2.b).3: Sets ULD Target Load Demand to zero by holding the toggle switch on the ULD ICS Control Station (CC) until the demand indicator reads zero, and verifies proper ICS and CRD System response. Obtains CRS verification of setpoint.
EXAMINER'S NOTE:		**Once the TS call is made, sufficient reactivity manipulation has been observed, and Reactor Power is approximately 90%, Go to Event 4.**

Op Test No.:	1	Scenario #	1	Event #	4	Page	20 of 31
Event Description:	MW Generated Input to ICS Fails to Zero Volts						

Time	Position	Applicant's Actions or Behavior

Booth Operator Instructions:	**When directed by the Lead Examiner INITIATE Event 4.**

Indications Available: RCS Pressure transient, RCS Temperature transient, Reactor Power rises rapidly, Multiple Annunciators in alarm.

Time	Position	Applicant's Actions or Behavior
	Crew	Diagnoses loss of MW Generated Input Failure.
	CRS	DIRECTS entry into OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET
		OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET
	URO	Step 2.1 (**IMA**): Places the Diamond Station in Manual by pressing the Manual/Auto pushbutton on the Diamond Panel and observing the Manual light is lit and the Auto light is not lit (CC)
	URO	Step 2.2 (**IMA**): Places SG A FW Demand and SG B FW Demand ICS Stations in HAND by pressing the HAND pushbuttons on each ICS Station and verifying the white HAND lights are lit and the red AUTO lights are not lit on the selected ICS stations (CC).
	URO	Step 2.3 (**IMA**): Verifies Turbine Header Pressure is between 835 and 935 psig as read on the Turbine Header Pressure digital indication (CL)
	URO	Step 2.4 (**IMA**): Verifies RCS Pressure is lowering and/or less than 2205 PSIG by observing RCS pressure meters (CC and PC). As required, if RCS Pressure is >2205 psig, URO places RC-V-1 control in Manual (CC), opens RC-V-1 fully by pressing the open pushbutton and observing the red open light lit and the green closed light not lit (CC), and then places RC-V-1 control back to AUTO.

Op Test No.:	1	Scenario #	1	Event #	4	Page	21 of 31
Event Description:	MW Generated Input to ICS Fails to Zero Volts						

Time	Position	Applicant's Actions or Behavior
EXAMINER'S NOTE:		**OP-TM-AOP-070, steps 3.1 and 3.2 are IAAT's that should not be applicable during this Event.**
	CRS	Step 3.3: Verifies the Main Turbine is reset by observing it on-line (CL).
	CRS	Step 3.4: Assigns manual control responsibilities and control bands as follows:
	URO	INSERT or WITHDRAW rods to maintain Reactor power within 1% of current power level by operating the Control Rod switch on the Diamond Panel as applicable (CC).
	ARO	Adjust FW Flow to maintain Tavg within 2 °F of current temperature by adjusting SG A and SG B FW Demand Station toggle switches as applicable (CC). Maintain Turbine Hdr Pressure within 10 psig of current pressure by adjusting Turbine Load Set Station demand as applicable (CC).
EXAMINER'S NOTE:		**OP-TM-AOP-070, step 3.5 is N/A.**
	URO	Step 3.6: Ensures SG/Reactor Demand, Reactor Demand, and SG A/B Load Ratio Demand Stations are in HAND by pressing each HAND pushbutton and observing white HAND lights are lit and red AUTO lights are not lit for each station. Observes that the ULD ICS Station is already in HAND by the white HAND light being lit.
EXAMINER'S NOTE:		**The CRS should recognize that Reactor Power is above 100% and direct a power reduction OP-TM-621-471, ICS MANUAL CONTROL.**
		OP-TM-621-471, ICS MANUAL CONTROL

Op Test No.:	1	Scenario #	1	Event #	4	Page	22 of 31
Event Description:	MW Generated Input to ICS Fails to Zero Volts						

Time	Position	Applicant's Actions or Behavior
	URO	Step 4.6.3: Inserts Control Rods using the Rod Control Switch on the Diamond Panel (CC) and observing rod insertion on the PI Panel (PC), the Group Indicator (CC), and lowering power on the power meters (CC).
		OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET
	CRS	Step 3.7: Verifies that MFW Pumps are controlling FW Valve dP greater than 30 psid (CL) and that Reactor Power is greater than 75% (CC).
EXAMINER'S NOTE:		**OP-TM-AOP-070, step 3.8 is N/A and 3.9 has already been verified.**
	ARO	Step 3.10 and 3.11: Maintains RCS pressure between 2105 and 2205 psig, controls RCS Tavg 578 to 580 °F, and controls RCS ΔTc < 5° F by adjusting SG A and SG B FW Demand Station toggle switches as applicable.
EXAMINER'S NOTE:		**OP-TM-AOP-070, steps 3.12 and 3.13 are N/A.**
EXAMINER NOTE:		**If the faulted instrument is identified, the crew may decide to select the alternate instrument, but the alternate instrument will not be able to be selected.**
EXAMINER NOTE:		**Once AOP-070 Actions are complete, and the plant is stable, Go to Event 5.**

Op Test No.:	1	Scenario #	1	Event #	5	Page	23	of 31
Event Description:		Loss of ICS Hand and Auto Power						

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 5.**
Indications Available:		**Map H-1-8 in alarm, ICS AUTO and HAND Available lights not lit (PC), various ICS powered indications not lit or mid-scale throughout the Control Room.**
	Crew	Diagnosis a Loss of ICS AUTO and HAND Power.
	CRS	Announces entry into OP-TM-AOP-025, LOSS OF ICS HAND AND AUTO POWER.
		OP-TM-AOP-025, LOSS OF ICS HAND AND AUTO POWER
	URO	Step 2.1 (**IMA**): Performs EOP-001, "Reactor Trip" Immediate Actions:
		OP-TM-EOP-001, Reactor Trip
	URO	Step 2.1 (**IMA**): Presses Both Reactor Trip and DSS pushbuttons (CC).
	URO	Step 2.2 (**IMA**): Verifies that the reactor is shutdown by one of the following: • Power Range nuclear instrumentation indicates less than 5% (CC) • All control rods are inserted (PC) • Source Range count rate is continuously lowering (CC)
	URO	Step 2.3 (**IMA**): Presses the Turbine Trip pushbutton (CL)
	URO	Step 2.4 (**IMA**): Verifies the Turbine Stop valves are closed by observing the indication on CL.
		OP-TM-AOP-025, LOSS OF ICS HAND AND AUTO POWER

Op Test No.:	1	Scenario #	1	Event #	5	Page	24 of 31
Event Description:	Loss of ICS Hand and Auto Power						

Time	Position	Applicant's Actions or Behavior
	URO/ARO	Step 2.2 (**IMA**): Trips both Main Feedwater Pumps by pressing the Trip pushbuttons for each MFW pump (CL) and observing overhead alarms are lit and lowering RPM's (CL).
	ARO	Step 2.3 (**IMA**): Initiates OP-TM-424-901, recognizes that Emergency Feedwater is running as expected.
	ARO	Performs a Symptom Check and recognizes that no additional conditions exist at this time.
EXAMINER'S NOTE:		**OP-TM-EOP-001 VSSV's will be performed simultaneously, but no credit is awarded in this scenario.**
	CRS	Step 2.4 (**IMA**): Initiates OP-TM-EOP-001, REACTOR TRIP.
CT-11	ARO	Step 3.1: Maintains OTSG pressure IAW Guide 6 using the ADV Backup Control Stations (CC).
	ARO	Step 3.2: Announces entry into OP-TM-AOP-025, "Loss Of ICS/NNI Hand And Auto Power", reactor trip and EFW actuation over the plant page and radio.
EXAMINER'S NOTE:		**OP-TM-AOP-025, step 3.3 is N/A.**
	URO	Step 3.4: Initiates Guide 9.
		OP-TM-EOP-010, GUIDE 9, RCS Inventory Control
	URO	Step A.1: Determines MU Tank Level and, when < 55", performs the RNO by opening MU-V-14A or MU-V-14B by pressing the Open pushbutton and verifying that the red open light is lit and the green closed light is not lit, and that MU Tank level is recovering (CC)
EXAMINER'S NOTE:		**OP-TM-AOP-025, step 3.5 is an IAAT that is N/A at this time.**

Op Test No.: 1	Scenario # 1	Event # 5	Page 25 of 31
Event Description:	Loss of ICS Hand and Auto Power		

Time	Position	Applicant's Actions or Behavior
	ARO	Step 3.6: Directs an Auxiliary Operators to place pressurizer level LO LO interlock switch to BYPASS.

Booth Operator Cue: If directed as an Auxiliary Operator to place pressurizer level LO LO interlock switch to BYPASS, insert RCR41 (bypass) and report back that pressurizer level LO LO interlock switch is in BYPASS.

Time	Position	Applicant's Actions or Behavior
	URO	Step 3.7: Initiates Guide 8, no action required at this time.

EXAMINER'S NOTE: Once the reactor has been tripped, IMA's are complete, and OTSG pressures are under control with the ADV's, Go to Event 6.

Op Test No.:	1	Scenario #	1	Event #	6,7	Page	26 of 31
Event Description:	Feedwater Line Break inside of the Reactor Building, Excessive Heat Transfer, Makeup Pump Minimum Recirc Valve fails closed.						

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 6.**
Indications Available:		**Reactor Building Pressure rising, RCS Pressure lowering, RB Temperature rising, 4# ESAS actuation (if crew does not manually initiate), "A" OTSG Pressure lowering, "A" OTSG Level lowering, Main Annunciators J-2-3 and NN-2-7 in alarm, RB Sump level rising.**
	CRS	Diagnoses Excessive Heat Transfer on the "A" OTSG and directs based on: ALL of the following conditions: • RCS average temperature below 540°F • Uncontrolled lowering of RCS temperature • Tsat for OTSG pressure is less than Tcold on affected OTSG(s)
	CRS	Announces entry into OP-TM-EOP-003, EXCESSIVE PRIMARY TO SECONDARY HEAT TRANSFER.
		OP-TM-EOP-003, EXCESSIVE PRIMARY TO SECONDARY HEAT TRANSFER
	ARO	Step 2.1 (**IMA**): Perform Rule 3, XHT
		OP-TM-EOP-010, RULE 3 EXCESSIVE HEAT TRANSFER
	ARO	Step 1: Verifies "A" OTSG level is <97.5% using the level meters (CC).
EXAMINER'S NOTE:		**OP-TM-EOP-010, Rule 3 step 2 has already been identified.**
Booth Operator Cue:		**If directed as an Auxiliary Operator to close FW-V-16A and/or FW-V-17A, acknowledge the order, but no action is needed as HSPS isolation will close these valves.**

Op Test No.:	1	Scenario #	1	Event #	6,7	Page	27 of 31
Event Description:	Feedwater Line Break inside of the Reactor Building, Excessive Heat Transfer, Makeup Pump Minimum Recirc Valve fails closed.						

Time	Position	Applicant's Actions or Behavior
		Step 3: Performs Phase 1 isolation of "A" OSTG by:
		___ Closing MS-V-1A by pushing the Close pushbutton and observing the Close light lit and the Open and Test lights not lit (CC).
		___ Closing MS-V-1B by pushing the Close pushbutton and observing the Close light lit and the Open and Test lights not lit (CC).
		___ Recognizes FW-V-17A should have closed on the HSPS Low OTSG Level signal, and verifies closed by contacting an Auxiliary Operator to report local position.
	ARO	___ Recognizes FW-V-16A should have closed on the HSPS Low OTSG Level signal, and verifies closed by contacting an Auxiliary Operator to report local position.
		___ Verifying FW-V-5A is closed by observing the Close light lit and the Open and Test lights not lit (CC).
		___ Verifying FW-V-92A is closed observing the Close light lit and the Open and Test lights not lit (CC).
		___ Verifying MS-V-3D, MS-V-3E, and MS-V-3F are closed by contacting an Auxiliary Operator to report local position.
		___ Closing MS-V-4A by rotating the Backup Loader Handwheel counter-clockwise and observing the green closed light lit and the red open light not lit. (CC)
		Step 4: Determines that the steam leak is in the Reactor Building and performs Step 4 RNO: Performs Phase 2 isolation of "A" OSTG by:
		___ Closing EF-V-30A by pressing the Manual pushbutton, observing the Manual lights lit and the auto lights not lit, then placing the control tab counter-clockwise until closed (may lock the tab in the close direction) (CL)
CT-17	ARO	___ Closing EF-V-30D by pressing the Manual pushbutton, observing the Manual lights lit and the auto lights not lit, then placing the control tab counter-clockwise until closed (may lock the tab in the close direction) (CL)
		___ Closing MS-V-2A by pressing the close pushbutton and observing the green closed light lit and the red open light not lit (CC).

Op Test No.:	1	Scenario #	1	Event #	6,7	Page	28 of 31
Event Description:	Feedwater Line Break inside of the Reactor Building, Excessive Heat Transfer, Makeup Pump Minimum Recirc Valve fails closed.						

Time	Position	Applicant's Actions or Behavior
	ARO	Step 7: Initiates Guide 12, no action required at this time.
		OP-TM-EOP-003, EXCESSIVE PRIMARY TO SECONDARY HEAT TRANSFER
	URO	Step 2.2 **(IMA):** Initiate Guide 9, RCS INVENTORY CONTROL.
		OP-TM-EOP-010, GUIDE 9, RCS INVENTORY CONTROL
	URO	Step D.1: Verify HPI is throttled IAW Rule 2:
EXAMINER'S NOTE:		**OP-TM-EOP-010, RULE 2, Steps A.1 through A.3 are N/A.**
		OP-TM-EOP-010, RULE 2, HPI THROTTLING
	URO	Step A.4: Determines that SCM > 25F and HPI COOLING is not required, and throttles HPI IAW OP-TM-211-901, EMERGENCY INJECTION (HPI/LPI).
		OP-TM-211-901, EMERGENCY INJECTION (HPI/LPI)
	URO	Att. 7.3, Step 1: Defeats ESAS signals by pressing the defeat pushbuttons (manual and/or automatic signals as required).
	URO	Att. 7.3, Step 2: Receives CRS concurrence and secures MU-P-1A by rotating the Control Switch counter-clockwise and observing no amps, green light lit, red light not lit (CC).
	URO	Att. 7.3, Step 3: Obtains CRS concurrence to throttle HPI, determines that DH-V-7A and DH-V-7B are closed, and opens MU-V-36 by pressing the open pushbutton and observing the open light lit and the closed light not lit (CC
	URO	Att. 7.3, Step 4: Recognizes that MU-V-37 will not open by the closed light lit and open light not lit upon pressing the Open pushbutton (CC), continues in the procedure.

Op Test No.:	1	Scenario #	1	Event #	6,7	Page	29	of 31
Event Description:	Feedwater Line Break inside of the Reactor Building, Excessive Heat Transfer, Makeup Pump Minimum Recirc Valve fails closed.							

Time	Position	Applicant's Actions or Behavior
EXAMINER'S NOTE:		**OP-TM-211-901, Step 5 will be performed, but is not the priority. Guide 9 is initiated already, so the step is met, but it is important to move on and terminate HPI to avoid lifting the PORV.**
	URO	Att. 7.3, Step 6.A: Obtains CRS direction to terminate HPI and secures MU-P-1C by rotating the Control Switch counter-clockwise and observing no amps, green light lit, red light not lit (CR).
	URO	Att. 7.3, Step 6.B: Closes MU-V-16A and MU-V-16B by pressing the close pushbuttons for each valve and observing the closed lights lit and the open lights not lit (CC).
	URO	Att. 7.3, Step 6.C: Closes MU-V-16C and MU-V-16D by pressing the close pushbuttons for each valve and observing the closed lights lit and the open lights not lit (CR).
EXAMINER'S CUE:		**Role play as Shift Manager, as requested, and give permission to open MU-V-18.**
	URO	Att. 7.3, Step 10: Upon obtaining Shift Manager concurrence, determines that OP-TM-244-901 requirements are met and opens MU-V-18 by pressing the open pushbutton and observing the open light lit and the closed light not lit (CC).
CT-30	URO	Att. 7.3, Step 11: Determines that MU-V-37 is closed and throttles open a MU-V-16(A or B) to ensure MU or SI flow > 40gpm by observing MU flow indications (CC).
EXAMINER'S NOTE:		**URO May choose to throttle SI to ensure >40gpm instead of the above step.**

Op Test No.:	1	Scenario #	1	Event #	6,7	Page	30 of 31
Event Description:		Feedwater Line Break inside of the Reactor Building, Excessive Heat Transfer, Makeup Pump Minimum Recirc Valve fails closed.					

Time	Position	Applicant's Actions or Behavior

EXAMINER'S NOTE:	**Scenario can be terminated when the A OTSG is isolated and RCS inventory is under control (HPI terminated with >40gpm Makeup flow).**

Follow-up question highest event entered during scenario?

Answer: HA6, Thresholds 1 and 2a.

HA6 - FIRE or EXPLOSION – Affecting the Operability of Plant Safety Systems Required to Establish or Maintain Safe Shutdown.

EAL Threshold Values:

1. FIRE or EXPLOSION in any Table H2 area.

AND

2. a. Affected safety system parameter indications show degraded performance.

OR

b. Plant personnel report VISIBLE DAMAGE to permanent structures or safety system equipment within the specified area.

Op Test No.:	1	Scenario #	1	Event #	5	Page	31	of	31
Event Description:		Effects of Loss of ICS Hand And Auto Power							

Time	Position	Applicant's Actions or Behavior

Effects of Loss of ICS Hand And Auto Power

All ICS Hand/Auto station indicators fail midscale.
All ICS Hand/Auto station "AUTO" and "HAND" lights de-energized.
FW-V-16A, FW-V-16B, FW-V-17A, and FW-V-17B fail to mid position.
FW-P-1A and FW-P-1B fail to ~ 4100 rpm.
MS-V-3A, MS-V-3B, MS-V-3C, MS-V-3D, MS-V-3E, and MS-V-3F fail closed.
MS-V-4A and MS-V-4B transfer to B/U loaders.
Pressurizer heaters fail OFF (pressurizer low level interlock actuated in failed state).
RC-V-1 fails closed (manual operation available).
RC-RV-2 (PORV) fails closed (manual operation available).
Reactor transfers to diamond control.
Turbine transfers to EHC "LOCAL" control (Operator Work Station).
Inoperable RCP Start interlocks on RCS temperature >407 °F, RCP #1 Seal Δp.
Multiple failed indications in the Control Room.
Multiple invalid alarms in the Control Room (D-3-8, E-2-1, E-2-2, F-2-5, G-1-5, G-3-5, G-2-8, G-3-8, H-1-2, H-1-3, H-2-3, H-2-4)
Multiple inoperable alarms in the Control Room (E-3-1, E-3-2, F-3-1, F-3-2, G-2-5, H-1-1, H-1-4, H-1-5, H-1-6, H-1-7, H-2-1, H-2-2, H-2-5, H-3-2, H-3-3, H-3-4, H-3-5, PRF-6-8)

Facility:	Three Mile Island	Scenario No.: 2	Op Test No.: 10-02 NRC
Examiners:		Operators:	
Initial Conditions:	• (Temporary IC-232)		
	• 100% Power, MOL		
	• MO-P-1C and MO-P-1F are OFF for Chemistry purposes IAW OP-TM-431-403/406		
	• Crane work is occurring on the West side of the Plant to stage new piping		
	• "C" RPS Cabinet is in Manual Bypass due to faulted Thot instrument.		
Turnover:	Maintain 100% Power Operations		
Critical Tasks:	• Control SG Pressure (adjust TBVs/ADVs) to: Maintain RC Temperature Constant or Maintain Appropriate Pri-Sec ΔT/Cooldown Rate (CT-11)		
	• Turbine Trip (CT-18)		
	• Restore Feed to a Dry OTSG (CT-26)		

Event No.	Malf. No.	Event Type*	Event Description
1	ZAIRC1LIC	C CRS C URO	MU-V-17 Fails Closed in Auto, entry into OP-TM-211-472 (URO: Controls Pressurizer Level with MU-V-17 in Manual)
2	ED09D	TS CRS C ARO	Loss of D Inverter, Loss of VBD, entry into OP-TM-AOP-018 (ARO: Place Rad Monitors Interlock switches to Defeat, Restore Control Building, Auxiliary Building, Fuel Handling Building Ventilation)
3	NI15B	TS CRS	Nuclear Instrument, NI-6, Failure (TS)
4	IC23	I CRS I URO I ARO	SG/RX Demand Station fails to 0 Volts, Entry into OP-TM-AOP-070 (URO: ICS station to Manual, ARO: Controls temperature with SG A & B FW DEMAND stations in Manual)
5	TU01D	N CRS R URO N ARO	High Vibrations on Main Turbine, entry into OP-TM-MAP-K0201 and 1102-4, Reactor shutdown (URO/ARO: Power reduction with ICS in Manual)
6	FW15A FW15B TC02	C CRS C URO	Loss of both Main Feedwater Pumps, Turbine fails to trip, entry into OP-TM-EOP-001 (URO: IMA's of OP-TM-EOP-001)
7	FW17 FW18A FW18B	M CRS M URO M ARO	Loss of Emergency Feedwater Pumps, entry into OP-TM-EOP-004, Lack of Heat Transfer.
8	MS09A-F	C CRS C ARO	Turbine Bypass Valves fail Closed, OTSG Pressure control via Atmospheric Dump Valves (ARO: ADV control to Backup Loader)

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Three Mile Island NRC Scenario #2

Event #1: When the crew has accepted the watch, the Lead Examiner will cue the failure of MU-V-17. The crew will diagnose MU-V-17 closing by the controlling station indicating closed, lowering pressurizer level, rising Makeup Tank level, and/or Annunciator G-2-5, PZR LVL HI/LO, in alarm. An improper diagnosis will lead the crew to believe that there is an RCS leak. The URO will place the Control Station for MU-V-17 in HAND control and manually restore Pressurizer level.

Once MU-V-17 is in HAND control and Pressurizer level is being restored, the scenario can continue.

Event #2: The Lead Examiner will cue the Loss of Vital Bus "D". The effects of a loss of VBD which are significant to plant safety or operation are numerous. For each effect the required compensatory action is described in OP-TM-AOP-018.

This procedure stabilizes the plant and performs compensatory actions for equipment failures. It is considered a loss of Vital Bus "D" if the OTSGs are being used for RCS heat removal and an unplanned deenergization of VBD has occurred, and the following Critical Safety Functions are affected:

CSF 1, Reactivity and Reactor Power Control: Maintain control of the fission process, maintain the capability to shutdown the reactor and the capability to maintain the reactor in a shutdown condition. Control energy production and reactor power distribution based on design limits and current core heat removal capability. **Loss of VBD:** NI-4 and NI-8 are lost, but the remaining channels of nuclear instrumentation and incore detectors provide sufficient information to control power level and reactor power distribution.
CSF 6, Radiation Control and Control Room Habitability: Monitor and control the release of radiation to the environment. Maintain access to critical plant equipment and use of the Control Room. **Loss of VBD**: RM-L-6, RM-A-7, RM-A-4, and RM-A-6 are deenergized. Compensatory actions will be taken IAW ODCM requirements. Access to plant equipment and Control Room is not affected.
CSF 7, Electrical Power: Provide electrical power as required to accomplish the other Critical Safety Functions. Provide AC and DC power for emergency equipment operation and instrumentation systems. **Loss of VBD:** VBD is deenergized. Ability to accomplish other Critical Safety Functions is not compromised.
CSF 8, Auxiliary Emergency Systems: Provide equipment cooling (closed cooling and ventilation), and other support requirements to accomplish the other Critical Safety Functions. Provide Instrument Air for operation of EFW, ADVs, RCP Support Systems and some containment isolation valves. **Loss of VBD:** Ventilation will be lost to CB 322' Battery Rooms, Inverter Rooms, ES 480V Switchgear Rooms, and Remote Shutdown Area. Compensatory actions will be performed IAW OP-TM-AOP-034, "Loss of Control Building Cooling." Instrument air is not affected.

CSF 9, Fire Protection and Remote Shutdown Capability: Maintain means to prevent, detect and suppress fires, as well as the capability to perform a plant shutdown without access to the Control Room. **Loss of VBD:** Loss of PRF annunciators disables alarms PRF-5-1, Relay Room Fire, PRF-7-1, IWFS/TS Bldg Fire, PRF-7-6, UPS Fire, and PRF-7-7, Process Center Fire. HVB-4-10 remains available to annunciate a fire in the Relay Room, and Relay Room CO2 fire suppression remains operable. Sprinkler systems remain operable in IWFS/TS Bldg, UPS room, and Processing Center.

The crew will diagnose the loss of Vital Bus "D" by the "D" Reactor Protection System Cabinet being deenergized, NI-8 indication deenergized (CC), Multiple annunciator alarms, including one for a failed inverter, "D" powered HSPS lights lit, and a loss of the right monitor of the Position Monitor Panel. The ARO will place Radiation Monitor Interlock switches to Defeat, and restore Control Building, Auxiliary Building, and Fuel Handling Building Ventilation. The CRS will identify and declare the following Tech Spec: 3.5.1.9

When the radiation monitor interlock switches are in defeat, ventilation is running and the Tech Spec has been declared, the scenario can continue.

Event #3: The Lead Examiner will cue the failure of Nuclear Instrument, NI-6.

The crew will diagnose the failure of Nuclear Instrument, NI-6 by Annunciator H-3-2, SASS Mismatch (comparison between NI-5 and NI-6) in alarm, PPC point A0621 in alarm, and NI-6 console indication reading LOW (CC). The URO will ensure the plant is stabile. The CRS will identify and declare the following Tech Spec: 3.5.1.1

Once the Tech Spec has been declared, the scenario can continue.

Event #4: The Lead Examiner will cue the failure of the SG/RX Demand Station to Zero Volts. This will cause an ICS transient, which if not responded to swiftly, will cause a Reactor Trip.

The crew will diagnose the ICS failure by a rapid change in RCS pressure, Reactor Power rising, multiple annunciator alarms, and/or changes in indications at multiple ICS stations. Entry into OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET will be required based on RCS pressure not being controlled in ICS AUTO.

"RCS pressure is not being controlled" requires the operator to make a subjective determination, based on their skills, training, and experience. A determination that RCS pressure is being controlled should include the following elements: 1) The reason for the transient is understood 2) RCS pressure response is consistent with the expected response for the event 3) Automatic or manual control in accordance with normal operating procedures is effectively controlling RCS pressure. A conservative assessment (i.e. concluding that RCS pressure is not being controlled) is appropriate when the three conditions above cannot be satisfied. ICS failures are one class of events that can lead to an

upset in primary to secondary heat transfer. Most ICS failures can be mitigated by use of the appropriate manual control normal operating procedures.

This entry into AOP-070 is unique from the other scenarios because Reactor Power will lower to approximately 50% while RCS pressure rises. The URO will have to place the Diamond Panel in manual to control Reactor Power or RPS will trip the reactor on high RCS pressure.

Once the plant is stabilized in ICS HAND control, the scenario can continue.

Event #5: The Lead Examiner will cue the High Vibrations on Main Turbine.

The crew will diagnose the High Vibrations on Main Turbine by Annunciator K-2-1 in alarm, and multiple PPC points in alarm. The crew will commence a power reduction to < 45% with ICS in manual to trip the Main Turbine. This is the reactivity manipulation for the scenario.

Once sufficient reactivity manipulation has occurred, the scenario can continue.

Event #6: The Lead Examiner will cue the Loss of both Main Feedwater Pumps.

The crew will diagnose a loss of both Main Feedwater Pumps by multiple Annunciators in alarm, including M-1-1 and M-1-7, indicating that a loss of Main Feedwater has occurred. The crew will identify that the Main Turbine did not trip. The URO will perform the Immediate Manual Actions of OP-TM-EOP-001, REACTOR TRIP, to trip the Main Turbine. The ARO will perform a symptom check and verify proper response of Emergency Feedwater.

Once the reactor is tripped and a symptom check is performed, the scenario can continue.

Event #7/8: The lead examiner will cue the Loss of Emergency Feedwater Pumps, causing a lack of heat transfer.

The crew will diagnose a lack of heat transfer (LOHT) (OS-24 Attachment D) when one of the following sets of conditions is true:

– Incore temperature or Thot is rising above 580°F and at least one RC Pump is operating,
– Incore temperatures rising and NO FEEDWATER available,
– Incore temperatures rising and subcooled RCS circulation can not be confirmed.

The crew will enter OP-TM-EOP-004, LACK OF PRIMARY TO SECONDARY HEAT TRANSFER. The ARO will lower OTSG pressures using Atmospheric Dump Valves due to a failure of the Turbine Bypass Valves as follows:

The ARO will observe the Control Stations for MS-V-3A/B/C/D/E/F will be at 100% demand and the Atmospheric Dump Valves will indicate open. This can lead the ARO to believe that the Atmospheric Dump Valves are 100% open but this is not the case. The 100% demand signal is for the Turbine Bypass Valves, which will not open. The Atmospheric Dump Valves are already throttled open due to OTSG pressure reaching the proper setpoint for ADV lifting, and the crew may believe that control of the ADV's is established. However, the ADV's must be placed on the Backup Loader for manual control. The ARO will place the Atmospheric Dump Valves on Backup Loader control and open them sufficiently to lower OTSG pressure.

The ARO will then feed OTSG's using Condensate Booster Pumps. Once primary to secondary heat transfer has been established, the crew will control RCS cooldown rate using the OTSG's.

The scenario can be terminated when the "A" and "B" OTSG's are being fed from Condensate Booster pump flow, Primary to Secondary Heat Transfer has been established, and the rate of Cooldown of the RCS is controlled using ADV's.

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-11 - Control SG Pressure (adjust TBVs/ADVs) to: Maintain RC Temperature Constant or Maintain Appropriate Pri-Sec ΔT/Cooldown Rate - This is a critical task in that poor steam pressure control immediately following reactor trip will cause continued excessive RCS cooling to occur. This would significantly change the mitigation strategy of the event

- Critical task (CT-11) is to control Pri-Sec ΔT/Cooldown Rate via the Turbine Bypass Valves or Atmospheric Dump Valves manually. Alternately if the TBV's/ADV's are left in automatic, excessive RCS cooling may occur due to poor steam pressure control immediately following a reactor trip. An uncontrolled cooldown condition should be considered grounds for failure of the critical task.

Safety Significance: Following a reactor trip, SG pressures should be controlled using the TBVs/ADVs to prevent initial RCS cooldown. In the event that Heat Sink Protection System actuation is necessary the operator provides appropriate operation of this system for its control and plant stabilization. Proper control of SG pressures leads to enhanced transient mitigation capability of the plant as normal heat removal systems remain available.

Cues:
1. SPDS displays and associated alarms
2. P-T display and associated alarms
3. HSPS and associated alarms

Performance Indicators:
1. Operation of TBV/ADV controls
2. Operation of HSPS controls

Feedback:
1. RC temperature and pressure
2. SG level and pressure
3. MSSV status indication

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-18 – Turbine Trip - Whenever conditions exist such that a reactor trip is required, then the normally redundant actions of tripping the reactor and main turbine should be accomplished immediately. Tripping the main turbine provides assurance of a redundant trip signal to the main turbine electro-hydraulic control unit.

Safety Significance: When the reactor is tripped (shutdown), steam flow to the main turbine must be stopped in order to maintain the appropriate primary to secondary heat balance. When the appropriate primary to secondary heat balance is established, the normal heat removal systems are available for plant control thus enhancing the transient mitigation capability of the plant.

Cues:

1. Visual indications (closed generator output and exciter breakers, main turbine stop and control valves are not closed)
2. P-T display and associated alarms
3. Verbal alert by plant staff that all main turbine stop and control valves are not closed immediately following actuation of a reactor trip signal
4. Verbal alert by plant staff that main alternator output/exciter breakers are not open immediately following actuation of a reactor trip signal

Performance Indicators:

1. Operation of control room manual main turbine trip pushbutton
2. Main turbine trip alarm
3. Main turbine-generator exciter alarms
4. Main turbine-generator breaker status alarms

Feedback:

1. RC temperature and pressure
2. SG level and pressure
3. Mega-Watt electric indication
4. Main turbine-generator breaker status indications
5. Verbal notification by plant staff of main turbine trip status

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-26 - Restore Feed To a Dry SG - This is a critical task in that when establishing feed flow, ensure feed can be established without causing detrimental affects to personnel and key equipment. If RCP(s) are running, establish FW to the SG(s) and control FW flow to maintain RCS cooldown rate within limits. EFW flow is established at •450 GPM total flow and MFW flow is established at < 200,000 LBM/HR total flow.

- Critical task (CT-26) is to ensure trickle feed can be established without causing detrimental affects to personnel and key equipment. If RCP(s) are running, establish FW to the SG(s) and control FW flow to maintain RCS cooldown rate within limits. EFW flow is established at •450 GPM total flow and MFW flow is established at < 200,000 LBM/HR total flow. If no RCPs are running, establish EFW or MFW through the EFW nozzles and control FW flow to maintain RCS cooldown rate within limits. FW flow through the EFW nozzles is established at < 200 GPM (EFW or MFW) total flow.

Safety Significance: If it is decided to perform the cooldown by using trickle feeding, it will be necessary to control the rate of FW addition to the SGs to maintain RCS cooldown limits. The FW flow rate should be adjusted to get the desired cooldown rate. If possible EFW should be used to limit SG thermal stresses. If MFW is used with the MFW nozzles, it will only be effective with forced flow. Once heat transfer is restored in the SG, feed rates can be adjusted as necessary to control the cooldown and SG tube-to-shell ΔT.

Cues:

1. Low SG level alarms
2. Low SG pressure alarms
3. Verbal alert by plant staff that no SG is available for heat transfer

Performance Indicators:

1. Operation of EFW/MFW pump controls
2. Operation of EFW/MFW valve controls

Feedback:

1. EFW/MFW flow
2. SG level and pressure
3. RCS pressure and temperature
4. Verbal alert by plant staff of EFW/MFW flow status

Industry Experience:

- Harris Nuclear Plant Manual Scram Due to Loss of Feedwater (12/14/99)
- Oconee 1 Loss of Feedwater (5/26/00)
- 361-021102-1 - Automatic Reactor Scram on Loss of Main Feedwater (San Onofre Unit 2) (11/2/02)
- OE28735 – Main Turbine High Vibration Trips (Palo Verde Unit 1 and 3) (5/5/09)
- OE28433 – Loss of Vital Bus Due to a Failure of a Class 1E Ametek/SC1 Inverter (Three Mile Island Unit 1) (3/17/09)

PRA

- EF-P-1 loss (Risk Increase Factor)
- Feedwater Transient (Initiating Event)

Event	Description	Procedure Support
	Initial Set-up.	100% Power, MOL
1	MU-V-17 Fails closed in AUTO	OP-TM-MAP-G0205
2	Loss of D Inverter, Loss of VBD	OP-TM-AOP-018, Loss Of VBD
		Technical Specifications
3	Nuclear Instrument, NI-6, Failure	Technical Specifications
4	SG/RX Demand Station fails to Zero Volts	OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET
5	High Vibrations on Main Turbine	OP-TM-MAP-K0201, MN TURB VIBR/ECC HI
		1102-4, Power Operations
6	Loss of both Main Feedwater Pumps, Main Turbine Fails to Trip	OP-TM-EOP-001, Reactor Trip
7	Loss of Emergency Feedwater Pumps, entry into OP-TM-EOP-004, Lack of Heat Transfer.	OP-TM-EOP-004, Lack Of Primary To Secondary Heat Transfer
		OP-TM-EOP-010, Emergency Procedure Rules, Guides and Graphs
8	Turbine Bypass Valves fail Closed	OP-TM-EOP-010, Emergency Procedure Rules, Guides and Graphs

ACTION	COMMENTS / INSTRUCTIONS	DESCRIPTION
Initialization IC-232	100% HFP ICS full AUTO	Equilibrium XENON
Malfunction IC35A	Value: Insert When: Immediately	EFW Does Not Actuate On OTSG Low Level
Malfunction IC35B	Value: Insert When: Immediately	EFW Does Not Actuate On OTSG Low Level
Malfunction IC36A	Value: Insert When: Immediately	EFW Does Not Actuate On OTSG Low Level
Malfunction IC36B	Value: Insert When: Immediately	EFW Does Not Actuate On OTSG Low Level
Malfunction MS09A	Value: 0 When: Immediately	Turbine Bypass Valves Fail Closed
Malfunction MS09B	Value: 0 When: Immediately	Turbine Bypass Valves Fail Closed
Malfunction MS09C	Value: 0 When: Immediately	Turbine Bypass Valves Fail Closed
Malfunction MS09D	Value: 0 When: Immediately	Turbine Bypass Valves Fail Closed
Malfunction MS09E	Value: 0 When: Immediately	Turbine Bypass Valves Fail Closed
Malfunction MS09F	Value: 0 When: Immediately	Turbine Bypass Valves Fail Closed
Malfunction TC02	Value: Insert When: Immediately	Automatic Turbine Trip Disabled
Override 02A5A06-ZAIRC1LIC SP	Value: 0 When: Event 1	MU-V-17 Fails Closed in AUTO
Malfunction ED09D	Value: Insert When: Event 2	Loss of VBD
Malfunction NI15B	Value: Insert When: Event 3	NI-6 Failure
Remote IC23	Value: Insert When: Event 4	SG/RX Demand Station fails to Zero Volts
Malfunction TU01D	Value: 50 When: Event 5	High Vibrations on Main Turbine
Malfunction FW15A	Value: Insert When: Event 6	Loss of both Main Feedwater Pumps, ATWS
Malfunction FW15B	Value: Insert, 18 second delay When: Event 6	Loss of both Main Feedwater Pumps, ATWS
Malfunction FW17	Value: Insert When: Event 7	Loss of Emergency Feedwater Pump, EF-P-1

ACTION	COMMENTS / INSTRUCTIONS		DESCRIPTION
Malfunction FW18A	Value: When:	Insert, 30 second delay Event 7	Loss of Emergency Feedwater Pump, EF-P-2A
Malfunction FW18B	Value: When:	Insert, 60 second delay Event 7	Loss of Emergency Feedwater Pump, EF-P-2B
Remote HSR14	Value: When:	LT1042 Event 11	Selecting LT 1042
Remote HSR16	Value: When:	LT1040 Event 11	Selecting LT 1040
Remote HSR13	Value: When:	LT1050 Event 11	Selecting LT 1050
Remote HSR15	Value: When:	LT1048 Event 11	Selecting LT 1048

Op Test No.: 1	Scenario # 2	Event # 1	Page 13 of 28
Event Description:	MU-V-17 Fails Closed in Auto		

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 1**
Indications Available:		**MU-V-17 Controlling Station indicates 0 (CC), Flow indicator MU-24A/B FI read 0 (CC), Pressurizer level indicates lowering on LI-777A and RC1-LR (CC), Makeup Tank level indicates rising (CC), PPC Point A1028, MU Tank Pressure High, in alarm.**
	Crew	Diagnose a closure of MU-V-17 in AUTO control.
	CRS	Directs entry into OP-TM-211-472, MANUAL PRESSURIZER LEVEL CONTROL
		OP-TM-211-472, MANUAL PRESSURIZER LEVEL CONTROL
	URO	Step 4.2.1: Places MU-V-17 in HAND by pressing White HAND PB on the MU-V-17 Control Station (CC).
	URO	Step 4.2.2: Verifies the White HAND light is Lit and the Red AUTO light is not lit on the MU-V-17 Control Station (CC).
	URO	Step 4.2.3: Adjusts Pressurizer level as required, initially by moving the toggle switch in the upward direction, on the MU-V-17 Control Station (CC), to open MU-V-17 and raise pressurizer level.
EXAMINER'S NOTE:		**Once the Pressurizer level is being restored with MU-V-17 in HAND control, Go to Event 2.**

Op Test No.: 1	Scenario # 2	Event # 2	Page 14 of 28
Event Description:	Loss of D Inverter, Loss of VBD (TS)		

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 2**
Indications Available:		**Multiple Main Annunciator Panel Alarms illuminated, "D" RPS Cabinet deenergized, 1 of 2 Control Rod Positon Indication Panels deenergized, 1 Row of HSPS lights lit**
	Crew	Diagnosis a loss of Vital Bus "D".
	CRS	Direct entry into OP-TM-AOP-018, Loss of VBD.
		OP-TM-AOP-018, Loss of VBD
	ARO	Step 3.1: Announces entry into OP-TM-AOP-018, "Loss of VBD," over the plant page and radio.
EXAMINER'S NOTE:		**OP-TM-AOP-018, Steps 3.2-3.5 have no action required. If asked, as Shift Manager, state "there are no fuel movements in progress".**
	ARO	Step 3.6: Places RM-A-1G interlock switches in the DEFEAT position by turning the interlock defeat switch to the defeat position and verifying that Main Annunciator C-2-1 is in alarm.
	ARO	Step 3.7: Restores Control Tower ventilation IAW 1104-19, "Control Building Ventilation System."
EXAMINER'S NOTE:		**1104-19 has no direct section to recover from an RMS interlock. Section 3.7.2 is scripted below. Validators also used Section 3.4 which had the same steps in order as scripted below.**
		1104-19, Control Building Ventilation System

Op Test No.: 1	Scenario # 2	Event # 2	Page 15 of 28
Event Description:	Loss of D Inverter, Loss of VBD (TS)		

Time	Position	Applicant's Actions or Behavior
	ARO	Step 3.7.2.2.1: Makes a Plant Page Announcement ATTENTION Plant Personnel, Starting Control Building Ventilation, use caution when opening or closing Control Building doors due to the potential for high differential pressures to exist.
	ARO	Step 3.7.2.2.2: Verifies that fire alarms are clear for Control Tower and AIT on Panels H&V A/B and PL A/B.
	ARO	Step 3.7.2.2.3: Starts AH-E-19A by turning the Control Switch in the clockwise direction and observing the red light lit and green light not lit.
	ARO	Step 3.7.2.2.4: Starts AH-E-17A by turning the Control Switch in the clockwise direction and observing the red light lit and green light not lit.
	ARO	Step 3.7.2.2.5: Verifies AH-E-95A(B) has automatically started by observing the red light lit and green light not lit.
	ARO	Step 3.7.2.2.6/7: Presses "AH-D-28/617 RESET PB" on H&V PANEL and holds it in while Starting AH-E-20A by turning the Control Switch in the clockwise direction and observing the red light lit and green light not lit. Releases "AH-D-28/617 RESET PB" on H&V PANEL when AH-D-28/617 are OPEN as indicated by ESAS indication on PCR or white open light on H&V Panel
	ARO	Step 3.7.2.2.8: Selects AH-E-93A/94A for operation at H&V PANEL.

Booth Operator Cue: If directed as an Auxiliary Operator to:

- **START AH-E-21, then, after a pause, report back that "AH-E-21 is running".**
- **SECURE AH-E-90 and 91 fans from FH Bldg. 305 if running, then, after a pause, report back that "AH-E-90 and 91 are secured".**
- **START AH-E-26, then, after a pause, report back that "AH-E-26 is running".**

Op Test No.:	1	Scenario #	2	Event #	2	Page	16 of 28
Event Description:		Loss of D Inverter, Loss of VBD (TS)					

Time	Position	Applicant's Actions or Behavior
EXAMINER'S NOTE:		**OP-TM-AOP-018, Step 3.8 requires no action once Control Building Ventilation is restored.**
		OP-TM-AOP-018, Loss of VBD
	CRS	Step 3.8: Initiates OP-TM-AOP-034, "Loss of Control Building Cooling."
	ARO	Step 3.9: Places the following radiation monitor interlock switches in the DEFEAT position (PCR): • RM-A-4G • RM-A-6G • RM-G-9
	ARO	Step 3.10: Restores Auxiliary Building and Fuel Handling Building ventilation IAW 1104-15A, "Auxiliary and Fuel Handling Building Supply and Exhaust System."
		1104-15A, Auxiliary and Fuel Handling Building Supply and Exhaust System
	ARO	Step 3.3.2.1/2: Verifies AH-E-14B/D are running by observing the red lights lit and green lights not lit (H&V Panel).
	ARO	Step 3.4.2.1.A.1: Ensures open FH BLDG Isolation Dampers, AH-D-120,121,122 (H&V Panel), by turning the Control Switch clockwise and verifying the red light is lit, green light not lit.
	ARO	Step 3.4.2.1.A.2: Starts AH-E-10 by turning the Control Switch in the clockwise direction and observing the red light lit and green light not lit.
	ARO	Step 3.4.2.1.B: Starts AH-E-11 by turning the Control Switch in the clockwise direction and observing the red light lit and green light not lit. Observes flows trending upward on AH-FR-149, 150, and 151 (H&V Panel)

Op Test No.:	1	Scenario #	2	Event #	2	Page	17 of 28
Event Description:	Loss of D Inverter, Loss of VBD (TS)						

Time	Position	Applicant's Actions or Behavior
Booth Operator Cue:		**If directed to select instruments in HSPS Cabinet IAW AOP-018 Step 3.12, then INSERT EVENT #11, then report the instruments as selected.**
		OP-TM-AOP-018, Loss of VBD
	CRS	Step 3.12: Directs an Auxiliary Operator to select the following instruments in HSPS Cabinet Section A2 Rack 4 for EF-V-30B and EF-V-30D control: - LT-1042 - LT-1040 - LT-1050 - LT-1048
EXAMINER'S NOTE:		**A Tech Spec does exist for PORV Position Monitors, also a 7 day clock, but can be exited by closing the PORV Block Valve.**
	CRS	Declares a 3.5.5.2 (7 Day) Tech Spec clock, based on RM-G-26 or RM-G-22.

EXAMINER'S NOTE: T.S. 3.5.5.2: The channels identified for the instruments specified in Table 3.5-3 shall be OPERABLE. With the number of instrumentation channels less than required, restore the inoperable channel(s) to OPERABLE in accordance with the action specified in Table 3.5-3.

Table 3.5-3, Action A: With the number of OPERABLE channels less than required by the Minimum Channels OPERABLE requirements:

1. either restore the inoperable channel(s) to OPERABLE status within 7 days of the event, or

2. prepare and submit a Special Report within 30 days following the event outlining action taken, the cause of the inoperability and the plans and schedule for restoring the system to OPERABLE status.

EXAMINER'S NOTE: **Once ventilation has been restored and the Tech Spec call made, Go to Event 3.**

Op Test No.:	1	Scenario #	2	Event #	3	Page	18 of 28
Event Description:	Nuclear Instrument, NI-6, Failure (TS)						

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions: When directed by the Lead Examiner, INITIATE Event 3.		
Indications Available: NI-6 Power reads 0 (CC), NI-6 Imbalance reads 0 (CC), PPC Point A0621 in alarm.		
	Crew	Diagnoses loss of NI-6, performs a stability check.
	CRS	Declares a 3.5.1.1 (1 Hour) Tech Spec clock.
EXAMINER'S NOTE: T.S. 3.5.1.1: The reactor shall not be in a startup mode or in a critical state unless the requirements of Table 3.5-1, Column "A" and "B" are met, except as provided in Table 3.5-1, Column "C". Specification 3.0.1 applies. **Table 3.5-1 Action (a): Restore the conditions of Column (A) and Column (B) within one hour or place the unit in HOT SHUTDOWN within an additional 6 hours.**		
	CRS	Briefs a Reactor Shutdown IAW 1102-4, Power Operations
EXAMINER'S NOTE: Once the TS call is made, Go to Event 4.		

Op Test No.:	1	Scenario #	2	Event #	4	Page	19 of 28
Event Description:	SG/RX Demand Station fails to 0 Volts						

Time	Position	Applicant's Actions or Behavior

Booth Operator Instructions: **When directed by the Lead Examiner INITIATE Event 4.**

Indications Available: Power reduces faster than the ULD input calls for, Main Annunciators H-2-1, H-1-4, and H-3-2 in alarm, RCS Pressure reduces.

	Crew	Diagnoses an ICS transient.
	CRS	DIRECTS entry into OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET
		OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET
	URO	Step 2.1 (**IMA**): Places the Diamond Station in Manual by pressing the Manual/Auto pushbutton on the Diamond Panel and observing the Manual light is lit and the Auto light is not lit (CC)
	URO	Step 2.2 (**IMA**): Places SG A FW Demand and SG B FW Demand ICS Stations in HAND by pressing the HAND pushbuttons on each ICS Station and verifying the white HAND lights are lit and the red AUTO lights are not lit on the selected ICS stations (CC).
	URO	Step 2.3 (**IMA**): Verifies Turbine Header Pressure is between 835 and 935 psig as read on the Turbine Header Pressure digital indication (CL)

Op Test No.:	1	Scenario #	2	Event #	4	Page	20 of 28
Event Description:		SG/RX Demand Station fails to 0 Volts					

Time	Position	Applicant's Actions or Behavior
	URO	Step 2.4 (**IMA**): Verifies RCS Pressure is lowering and/or less than 2205 PSIG by observing RCS pressure meters (CC and PC). As required, if RCS Pressure is >2205 psig, URO places RC-V-1 control in Manual (CC), opens RC-V-1 fully by pressing the open pushbutton and observing the red open light lit and the green closed light not lit (CC), and then places RC-V-1 control back to AUTO.
EXAMINER'S NOTE:		**OP-TM-AOP-070, steps 3.1 and 3.2 are IAAT's that should not be applicable during this Event.**
	CRS	Step 3.3: Verifies the Main Turbine is reset by observing it on-line (CL).
	CRS	Step 3.4: Assigns manual control responsibilities and control bands as follows:
	URO	INSERT or WITHDRAW rods to maintain Reactor power within 1% of current power level by operating the Control Rod switch on the Diamond Panel as applicable (CC).
	ARO	Adjust FW Flow to maintain Tavg within 2 °F of current temperature by adjusting SG A and SG B FW Demand Station toggle switches as applicable (CC). Maintain Turbine Hdr Pressure within 10 psig of current pressure by adjusting Turbine Load Set Station demand as applicable (CC).
	URO	Step 3.6: Ensures SG/Reactor Demand, Reactor Demand, and SG A/B Load Ratio Demand Stations are in HAND by pressing each HAND pushbutton and observing white HAND lights are lit and red AUTO lights are not lit for each station. Observes that the ULD ICS Station is already in HAND by the white HAND light being lit.

Op Test No.:	1	Scenario #	2	Event #	4	Page	21 of 28
Event Description:	SG/RX Demand Station fails to 0 Volts						

Time	Position	Applicant's Actions or Behavior
	CRS	Step 3.7: Verifies that MFW Pumps are controlling FW Valve dP greater than 30 psid (CL) and that Reactor Power is greater than 75% (CC).
EXAMINER'S NOTE:		**OP-TM-AOP-070, step 3.8 is N/A and 3.9 has already been verified.**
	ARO	Step 3.10 and 3.11: Maintains RCS pressure between 2105 and 2205 psig, controls RCS Tavg 578 to 580 °F, and controls RCS ΔTc < 5° F by adjusting SG A and SG B FW Demand Station toggle switches as applicable.
EXAMINER'S NOTE:		**OP-TM-AOP-070, steps 3.12 and 3.13 are N/A.**
EXAMINER NOTE:		**Once the Plant has been stabilized, Go to Event 5.**

Op Test No.:	1	Scenario #	2	Event #	5	Page	22	of	28
Event Description:	High Vibrations on Main Turbine, Reactor shutdown								

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 5.**
Indications Available:		**Main Annunciator K-2-1 in alarm, Multiple PPC alarms.**
	Crew	Diagnosis High Vibrations on Main Turbine.
	CRS	Directs entry into OP-TM-MAP-K0201, MN TURB VIBR/ECC HI
Booth Operator Cue:		**If contacted as Electrical Maintenance and/or the Maintenance Director, acknowledge directions.**
		OP-TM-MAP-K0201, MN TURB VIBR/ECC HI
	ARO	Step 4.2: Determines that the unit is at power and vibrations are > 6 Mils, and notifies Elec. Maint. And the Maintenance Director.
	CRS	Step 4.3: Determines that the unit is at power, and directs the URO to reduce load to ≤ 45 percent.
EXAMINER'S NOTE:		**OP-TM-MAP-K0201, Steps 4.3-4.9 are N/A.**
		1102-4, Power Operations
	CRS	Step 3.3.2.A.2.c): Recognizes that SG/REACTOR DEMAND is in HAND, and has the URO REDUCE reactor power IAW OP-TM-621-471 "ICS Manual Control"
		OP-TM-621-471, ICS Manual Control
	URO	Step 4.6.3: URO Inserts Control Rods placing the Diamond Control Switch (CC) in the Insert direction, and verifying proper response from the CRD System (CC).
EXAMINER'S NOTE:		**Once sufficient reactivity manipulation is observed, Go to Event 6.**

Op Test No.: 1	Scenario # 2	Event # 6	Page 23 of 28

Event Description: Loss of both Main Feedwater Pumps, Main Turbine fails to trip, EFW Valves fail in Auto

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 6.**
Indications Available:		**Main Annunciator M-1-1 and M-1-7 in alarm, Reactor Power reduces to zero, rod bottom lights lit, Emergency Feedwater starts.**
	Crew	Diagnoses the loss of both Main Feedwater Pumps, Reactor trip, and the Turbine failing to trip.
	CRS	Directs entry into OP-TM-EOP-001, Reactor Trip
		OP-TM-EOP-001, Reactor Trip
	URO	Step 2.1 (**IMA**): Presses Both Reactor Trip and DSS pushbuttons (CC).
	URO	Step 2.2 (**IMA**): Verifies that the reactor is shutdown by one of the following: Power Range nuclear instrumentation indicates less than 5% (CC) All control rods are inserted (PC) Source Range count rate is continuously lowering (CC)
CT-18	URO	Step 2.3 (**IMA**): Recognizes that the Main Turbine did not trip and presses the Turbine Trip pushbutton (CL). Announces to the CRS that the Main Turbine did not trip.
	URO	Step 2.4 (**IMA**): Verifies the Turbine Stop valves are closed by observing the indication on CL.
	ARO	Step 3.1: Performs a Symptom Check and recognizes that no additional conditions exist at this time.
EXAMINER'S NOTE:		**Once the symptom check is complete and OTSG's are being fed with EFW, Go to Event 7.**

Op Test No.:	1	Scenario #	2	Event #	7,8	Page	24	of	28
Event Description:	Loss of Emergency Feedwater Pumps, Lack of Heat Transfer, Turbine Bypass Valves fail Closed.								

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 7.**
Indications Available:		**EF-P-2A/B indicate no amps, green and amber lights lit, red light not lit, EF-P-1 indicate zero RPM and zero steam pressure, Multiple Main Annunciator alarms, Incore temperatures rising.**
	Crew	Diagnosis Loss of Emergency Feedwater and a Lack of Heat Transfer
	CRS	Directs entry into OP-TM-EOP-004, Lack of Primary to Secondary Heat Transfer based on: - Incore temperatures rising and NO FEEDWATER available
		OP-TM-EOP-004, Lack of Primary to Secondary Heat Transfer
	URO	Step 3.1: Shuts down 2 Reactor Coolant Pumps to leave one Pump operating per loop by rotating each Control Switch counter-clockwise (CC) and observing green light lit, red light not lit (CC), zero amps (CC), and RC Low Flow alarms (MAP)
	ARO	Step 3.3: Announces Reactor Trip, if not already performed.
EXAMINER'S NOTE:		**OP-TM-EOP-004, Step 3.4 is met, 3.5-3.9 are N/A at this time.**
	CRS	Step 3.10: Verifies all of the following conditions are met: - A Condensate Booster Pump is On - At least one RCP is On - An OTSG is intact And directs the ARO to Perform Attachment 1, "OTSG Feed Using a Condensate Booster Pump".

Op Test No.:	1	Scenario #	2	Event #	7,8	Page	25 of 28

Event Description: Loss of Emergency Feedwater Pumps, Lack of Heat Transfer, Turbine Bypass Valves fail Closed.

Time	Position	Applicant's Actions or Behavior
		OP-TM-EOP-004, Lack of Primary to Secondary Heat Transfer, Attachment 1
	ARO	Step 2: Verifies that FW-V-16A and FW-V-16B are closed by the indications at each valve's ICS controlling station (CC)
	ARO	Step 4: Opens FW-V-6 by pressing the Open pushbutton and observing the Open light lit and the Closed light not lit (CL)
	ARO	Step 7: Determines that the MS-V-3's cannot be throttled to maintain OTSG Press 500-600 psig
	ARO	Step 7 RNO: Throttles MS-V-4A and MS-V-4B by pressing the Backup Loader pushbutton (CC) to place ADV control on the Backup Loader, and then rotating each ADV handwheel (CC) clockwise or counter clockwise, as appropriate, to maintain OTSG Press 500-600 psig.
	ARO	Step 5: For each OTSG: Defeats OTSG Lo-Lo Pressure MFW Isolation when each OTSG Pressure < 750 psig by pressing the OTSG Lo-Lo Pressure MFW Isolation pushbuttons (CL and CC), and observing defeat lights lit, and MAP alarms come in.
	ARO	Step 6: For each OTSG: When OTSG Press < 600 psig, feeds IAW Rule 4.
		OP-TM-EOP-010, Rule 4, Feedwater Control
CT-26	ARO	Step 3: Recognizes the OTSG's are dry and, per the RNO, maintains MFW flow < 0.2 Mlb/HR / OTSG by throttling open MS-V-16A and MS-V-16B.
		OP-TM-EOP-004, Lack of Primary to Secondary Heat Transfer
	ARO	Step 3.20/3.21: When primary to secondary heat transfer has been restored, adjusts OTSG pressure IAW Guide 6.
		OP-TM-EOP-010, Guide 6, OTSG Pressure Control

Op Test No.:	1	Scenario #	2	Event #	7,8	Page	26 of 28

Event Description: Loss of Emergency Feedwater Pumps, Lack of Heat Transfer, Turbine Bypass Valves fail Closed.

Time	Position	Applicant's Actions or Behavior
	ARO	Steps 1-4: Verifies that the HSPS LoLo Pressure MFW Isolation switches are already in defeat by the switch positions pointing to each associated word "defeat". (CL and CC) Verifies Subcooling Margin is greater than 25F as indicated on the Saturation Margin meters (PC). Verifies an RCS Cooldown is not required by no procedure requirement is met. Verifies RCS leakage is not causing an RCS cooldown by RM-A-2 counts not rising (PL)
CT-11	ARO	Step 5: Stabilizes Tcold and maintains OTSG pressures less than 1020 psig by dialing the Backup Loader clockwise or counter clockwise, as required, for each Atmospheric Dump Valve.

EXAMINER'S NOTE: Scenario can be terminated when "A" and "B" OTSG's are being fed with Condensate Booster Pump flow, and Tcold is being stabilized with the Atmospheric Dump Valves.

Follow-up question highest event entered during scenario?

Answer: None, since all actions were taken properly to avoid an event.

Op Test No.: 1	Scenario # 2	Event # 2	Page 27 of 28
Event Description:	EFFECTS OF LOSS OF VBD		

Time	Position	Applicant's Actions or Behavior

EFFECTS OF LOSS OF VBD
One channel of CRD Trip Confirm will de-energize to its actuate state but the other channel remains operable. Turbine will not trip and FW-V-5A/B will not close.
"D" RPS channel de-energizes. CRD-CB-1D open. "D" RPS channel trip signal is sent to all other RPS cabinets. (TS Table 3.5-1)
RCPPM-1D&2D de-energize. RC-P-1D tripped signal is sent to RPS Channels A, B, and C, and HSPS EFW Initiation Train A & Train B.
ES Relay Cabinet 3B de-energizes: 1 channel tripped in all ES actuations, B train only.
HSPS Channel IV de-energizes. HSPS Channel IV tripped signal sent to HSPS Trains A & B.
Multiple SASS transfers occur due to loss of HSPS Channel IV instruments.
Annunciator SER B de-energizes. MAP annunciator power remains on VBC. Annunciator Panel PL transfers to backup power from TRA. All Annunciators on PRF and PRF1 fail.
Loss of power to RM-L-6 will close WDL-V-257.
Loss of power to RM-A-6G will trip AH-E-11.
Loss of power to RM-A-4G will trip AH-E-10 and close dampers AH-D-120, AH-D-121, and AH-D-122.
Loss of power to RM-A-7G will close WDG-V-47.
Loss of power to RM-A-1G trips AH-E-17A/B, AH-E-20A/B, AH-E-21, AH-E-26, AH-E-93A/B, AH-E-94A/B & AH-E-95A/B, closes AH-D-28,37&39, and opens AH-D-36.
Loss of power to RM-G-9 Trips AH-E-10 and closes AH-D-120, AH-D-121, and AH-D-122.
AH-D-30A-G and AH-D-31A-G fail closed, resulting in loss of ventilation to: A&B Battery Rooms A&B Inverter Rooms 1P & 1S 480V ES Switchgear Rooms Remote Shutdown Area.
Control room radio on Computer Console, P.E.M.A radio, and Scanner will be inoperable. Control room radio on CRS desk will remain operable.
Invalid alarms: C-1-1 J-1-5 J-1-6
Inoperable alarms: All PRF annunciators All PRF1 annunciators C-1-5 G-1-6 G-1-7

Op Test No.: 1	Scenario # 2	Event # 2	Page 28 of 28
Event Description:	EFFECTS OF LOSS OF VBD		

Time	Position	Applicant's Actions or Behavior

EFFECTS OF LOSS OF VBD (cont)

Inoperable Instrumentation:

- BS-PT-1189, RB Pressure
- DH-LT-811, RB ECCS Sump Level (CR) (T.S. Table 3.5-3)
- Exciter Voltage and Current indication
- FW-LT-1041, "A" OTSG Operating Range
- FW-LT-1043, "A" OTSG Startup Range
- FW-LT-1049, "B" OTSG Operating Range
- FW-LT-1051, "B" OTSG Startup Range
- MS-PT-1181, "A" OTSG Pressure
- MS-PT-1183, "B" OTSG Pressure
- NI-4, Intermediate Range
- NI-8, Power Range
- PORV Acoustic Position Monitor (TS Table 3.5-2)
- RC-DPT-921, PORV Tailpipe ΔP (TS Table 3.5-2)
- RC-DPT-922, Code Safety A Discharge Pipe ΔP (TS Table 3.5-2)
- RC-DPT-923, Code Safety B Discharge Pipe ΔP (TS Table 3.5-2)
- RC-LT-1037, RCS Drain Down Level
- RM-A-1 (PIG), Control Room
- RM-A-4 (PIG), FHB (ODCM Part 1 Table 2.1-2)
- RM-A-6 (PIG), AB (ODCM Part 1 Table 2.1-2)
- RM-A-7G, Waste Gas Effluent (ODCM Part 1 Table 2.1-2)
- RM-G-3, Sampling Room
- RM-G-4, Hot Machine Shop
- RM-G-7, RB Main Fuel Handling Bridge (TS 3.8.1)
- RM-G-9, Spent Fuel Bridge (TS 3.8.1)
- RM-G-15, Heat Exchanger Vault
- RM-G-22, RB High Range (TS Table 3.5-3)
- RM-G-26, A OTSG Steam Line (TS Table 3.5-3)
- RM-L-6, Liquid Radioactive Waste Discharge (ODCM Part 1 Table 2.1-1)
- SSA-3 / SSP-1, Seismic Monitoring Panel
- WDL-LT-805, RB Normal Sump Level
- WDL-LT-807, RB Flood Level (TS Table 3.5-3)

Facility:	Three Mile Island	Scenario No.: 4	Op Test No.: 10-02 NRC
Examiners:		Operators:	

Initial Conditions:

- (Temporary IC-234)
- 100% Power, MOL
- MO-P-1C and MO-P-1F are OFF for Chemistry purposes IAW OP-TM-431-403/406
- Crane work is occurring on the West side of the Plant to stage new piping
- MU-P-1C is OOS IAW OP-TM-211-432, Removing MU-P-1C From Service, for bearing replacement
- ICS is in Manual due to a faulted Reactor Demand circuit card, expected to be replaced within 24 hrs

Turnover: Maintain 100% Power

Critical Tasks:

- Trip all RCPs (CT-1)
- Minimize SCM (CT-7)
- Maintain SG availability (CT-29)

Event No.	Malf. No.	Event Type*	Event Description
1	TH15A	TS CRS R URO N ARO	20 gpm tube leak on "A" OTSG, entry into OP-TM-EOP-005. (URO: commences a reactor shutdown with ICS in Manual, ARO: Place FW-P-1A/1B in HAND)
2	ES08A	I CRS I URO I ARO	Inadvertent 500# ESAS Signal, entry into OP-TM-AOP-046. (URO: OP-TM-AOP-046 IMA's. ARO: Restores Letdown following an inadvertant ESAS signal)
3	ED08B	TS CRS C ARO	Loss of "B" DC, entry into OP-TM-AOP-024. (ARO: Energizes 1M DC from "A" DC)
4	TC01	C CRS C URO	Main Turbine Trip, Reactor does not automatically trip, Entry into OP-TM-EOP-001. (URO: IMA's of OP-TM-EOP-001)
5	TH18A	C CRS C URO	Sheared shaft on RC-P-1A, entry into OP-TM-MAP-F0301 and OP-TM-226-151. (URO: Trips 1A 6900V Bus)
6	TH16A	M CRS M URO M ARO	OTSG Tube Rupture on "A" OTSG with a Loss of Subcooling Margin, entry into OP-TM-EOP-005, OP-TM-EOP-002.
7	FW18A	C CRS C ARO	EF-P-2A Trips, entry into OP-TM-EOP-010, Rule 4. (ARO: Feeds OTSG's with Main Feedwater)

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Three Mile Island NRC Scenario #4

Event #1: When the crew has accepted the watch, the Lead Examiner will cue the 20 gpm tube leak on "A" OTSG.

Any OTSG tube leak causes an abnormal increase in the release of radioactive materials to the environment. The most fundamental objective is to minimize this release. The prioritized objectives of this procedure are:

1. Maintain core cooling.
2. Minimize the activity release to the atmosphere (minimize release duration, rate and concentration of radioisotopes, particularly iodine)
3. Minimize the integrated tube leakage

30 seconds of MSSV actuation can release 75% of the iodine for the entire event. The main condenser provides for iodine removal due to the ability of water to absorb the iodine (at least temporarily) through the condensers 104 "partitioning factor". This phenomenon reduces off site does consequences to the point that the radiation limits listed in the EOP can not be reached regardless of the tube leak size and the number of fuel pin leaks. MSSV actuation provides an opportunity for failure resulting in an unisolable path for reactor coolant directly to the environment.

The crew will diagnose an OTSG tube leak based on RM-G-26, RM-A-5, and RM-A-15 indications (PR), Annunciator C-1-1 in alarm, and/or pressurizer level lowering (CC). The CRS will announce entry into OP-TM-EOP-005, OTSG TUBE LEAKAGE. The URO will perform reactor shutdown. The ARO will place FW-P-1A/1B in HAND control IAW OP-TM-EOP-005 and may lineup to feed to the RCS from the "B" RBCT for inventory control. The CRS will evaluate and declare Tech Spec 3.1.6.3

When sufficient reactivity manipulation has been observed, the scenario can continue.

Event #2: The Lead Examiner will cue the Inadvertent "A" 500# ESAS Signal. The crew must quickly recognize the condition and perform the required Immediate Manual Actions to minimize the RCS pressure transient and pressurizer in-surge due to HPI. Additionally, while at power, immediately reducing HPI also minimizes the possibility of a reactor trip on high RCS pressure. The following Critical Safety Functions are affected by an inadvertent ESAS signal:

CSF 1, Reactivity & Reactor Power Control: Maintain control of the fission process, maintain the capability to shutdown the reactor and the capability to maintain the reactor in a shutdown condition. Control energy production and reactor power distribution based on design limits and current core heat removal capability. **HPI Actuation** will insert negative reactivity as borated water from the BWST will be injected into the RCS. ICS will pull control rods to maintain ULD demand and RCS Tave. Potential all rods out condition. As primary side power

decreases, ICS cross limits will lower feedwater flow in an attempt to match primary to secondary heat removal.
CSF 2, Reactor Vessel Inventory Control: Provide the means to maintain the core covered with sub cooled water. **HPI Actuation** will isolate RCS letdown and normal makeup. HPI will cause pressurizer level to rise. MU tank level will lower (MUT level/pressure requirements). BWST level will lower (BWST TS level).
CSF 3, RCS Integrity: Maintain the capability to control heatup and cooldown rates and control RCS pressure to prevent reactor vessel brittle fracture or LTOP events. Maintain RCP seal cooling to prevent excessive loss of RCS inventory through RCP seals. **HPI Actuation** will cause RCS pressure to rise. Seal Injection is not affected by an ES actuation. AOP-046 has the operator secure the remaining MU pump if the MU-V-16s cannot be closed from the control room. This action immediately terminates HPI and seal injection. The thermal barrier heat exchangers provide adequate seal cooling when the SI is secured. AOP-046 ensures adequate thermal barrier cooling prior to terminating seal injection. Once MU-V-36 and 37 are opened locally and the appropriate MU-V-16s are closed, a makeup pump is restarted and SI is re-established.
CSF 4, Core Heat Removal: Provide the capability to remove core heat production at all times. **HPI Actuation** will inject cold BWST into the RCS. The RCS will also cool due to the negative reactivity insertion from the injected BWST water lowering core power.
CSF 5, Containment Integrity: Provide means to prevent or minimize fission product release to the environment. (1) Maintain containment pressure below design and (2) Provide capability to isolate the containment when required. An inadvertent **HPI Actuation** will start the Reactor River system, and the RB cooling fans will be running in slow speed. Normal cooling to the RB cooling fans will be isolated. RB Temperature and pressure will lower due to the actuation of the RR system. The degree of temperature reduction would depend of river temperature. Building Spray System valves will open to align the BWST to the RB, but the BS pumps would not start unless a 30# signal is present. Closure of the containment isolation valves under the HPI signal would not adversely affect their associated systems.
CSF 7, Electrical Power: Provide electrical power as required to accomplish the other Critical Safety Functions. Provide AC and DC power for emergency equipment operation and instrumentation systems. An inadvertent **HPI Actuation** will start the emergency diesel generators unloaded.
CSF 8, Auxiliary Emergency Systems: Provide equipment cooling (closed cooling & ventilation), and other support requirements to accomplish the other Critical Safety Functions. Provide Instrument Air for operation of EFW, ADVs, RCP Support Systems and some containment isolation valves. An inadvertent **HPI Actuation** will start support systems to support ECCS and RB cooling systems. The DC and DR pumps will start to support MUP and DHP cooling which would be running during an inadvertent actuation. ES selected NS and NR pumps will start. Two NR and NS pumps are normally running. There is a potential for three NS pumps running which would start an overcooling of the NS system.
CSF 9, Fire Protection & Remote Shutdown Capability: Maintain means to prevent, detect, and suppress fires, as well as the capability to perform a plant shutdown without access to the Control Room. An inadvertent **HPI Actuation** would trip FS-P-2.

The crew will diagnose the Inadvertent "A" 500# ESAS Signal by multiple annunciators in alarm, "A" Train components in their ES actuated state, and/or "A" EDG running, while all primary indications appear steady or rising (RCS pressure not at 500#). The URO will perform the Immediate Manual Actions of OP-TM-AOP-046, INADVERTANT ESAS. The ARO will restore letdown IAW OP-TM-211-950 (performing the appropriate portion of the procedure when restoring from isolation following an ESAS signal).

Once the plant is stabilized and Letdown is restored, the scenario can continue.

Event #3: The Lead Examiner will cue the complete Loss of "B" DC. Under plant operating conditions there are no DC ties between redundant engineered safeguards equipment, switchgear, motors, and so forth, and, therefore, no single failure of any DC component will adversely affect the operation of the 100 percent redundant diesel generators. However, the following Critical Safety Functions are affected:

CSF 1, Reactivity and Reactor Power Control: Maintain control of the fission process, maintain the capability to shutdown the reactor and the capability to maintain the reactor in a shutdown condition. Control energy production and reactor power distribution based on design limits and current core heat removal capability. **Loss of "B" DC:** Reactor shutdown capability is affected due to loss of shunt trips on Reactor Trip Breakers CRD CB-1B and 1D. Normal undervoltage trips will still function to open CRD breakers and the DSS Electronic Trips are still available to de-energize the CRD mechanisms, either of which will insert control rods.

CSF 2, Reactor Vessel Inventory Control: Provide the means to maintain the core covered with sub cooled water. **Loss of "B" DC:** MU-P-1C (and MU-P-1B if on 1E Bus) can not be started remotely. If running, MU-P-1B-E continues to operate. MU-P-1A remains available. ES Train "B" manual actuation is inoperable. "A" train manual actuation remains available, as do all automatic actuations.

CSF 3, RCS Integrity: Maintain the capability to control heatup and cooldown rates and control RCS pressure prevent reactor vessel brittle fracture or LTOP events. Maintain RCP seal cooling to prevent excessive loss of RCS inventory through RCP seals. **Loss of "B" DC:** RCP total SI flow interlock is inoperable for RC-P-1B & 1D. SI flow indication remains available, and RCPs can be tripped either locally at the breakers, or by deenergizing 6900V busses.

CSF 4, Core Heat Removal: Provide the capability to remove core heat production at all times. **Loss of "B" DC:** EF-P-2B will not autostart, or stop or start remotely. EF-P-1 starts and EF-P-2A remains available. "B" DH train is unavailable, but "A" DH train remains available.

CSF 5, Containment Integrity: Provide means to prevent or minimize fission product release to the environment. (1) Maintain containment pressure below design and (2) Provide capability to isolate the containment when required. **Loss of "B" DC:** CA-V-5A fails open. CA-V-4A remains available to isolate the penetration. MU-V-26 fails open. MU-V-25 remains available. BS-P-1B is unavailable, but BS-P-1A remains available.

CSF 6, Radiation Control and Control Room Habitability: Monitor and control the release of radiation to the environment. Maintain access to critical plant equipment and use of the Control Room. **Loss of "B" DC:** EF-P-1 starts; exhaust constitutes unmonitored effluent pathway.
CSF 7, Electrical Power: Provide electrical power as required to accomplish the other Critical Safety Functions. Provide AC and DC power for emergency equipment operation and instrumentation systems. **Loss of "B" DC:** EG-Y-1B is inoperable; EG-Y-1A remains available. "B" side ES 4160V and 480V switchgear is inoperable due to loss of control power. "A" side ES 4160V and 480V switchgear remains available. Loss of DC power to inverters renders VBB and VBD inoperable. VBA and VBC remain operable.
CSF 8, Auxiliary Emergency Systems: Provide equipment cooling (closed cooling and ventilation), and other support requirements to accomplish the other Critical Safety Functions. Provide Instrument Air for operation of EFW, ADVs, RCP Support Systems and some containment isolation valves. **Loss of "B" DC:** DC-P-1B, DR-P-1B, NS-P-1C, NS-P-1B (if on 1S bus), NR-P-1C, NR-P-1B (if on 1T bus), RR-P-1B, and SW-P-1B are inoperable due to loss of breaker control power. Redundant train pumps remain available.
CSF 9, Fire Protection and Remote Shutdown Capability: Maintain means to prevent, detect and suppress fires, as well as the capability to perform a plant shutdown without access to the Control Room. **Loss of "B" DC:** Substation Control Building fire detection is inoperable. Air Intake Tunnel, Cooling Tower B, and Feedwater Pumps and Diesel Generators fire suppression is inoperable. Compensatory actions required by AP 1038 will be implemented.
CSF 10, Chemistry Control : Provide the means to monitor and control primary and secondary water chemistry in order to ensure the long term reliability of plant systems and limit the potential release of radioactive materials. **Loss of "B" DC:** CA-V-5A fails closed.

The crew will diagnose a complete Loss of "B" DC by multiple annunciator alarms, loss of multiple component indicators in the CR, and PPC alarms. The CRS will enter OP-TM-AOP-024, "B" DC SYSTEM FAILURE. The ARO will place the 1M DC control switch to "A" DC position. The CRS will evaluate and declare Tech Spec 3.7.2.g and Standard Tech Spec 3.8.4.

Once 1M DC is powered from "A" DC and the Tech Spec has been declared, then the scenario can continue.

Event #4: The Lead Examiner will cue the Main Turbine Trip.

The crew will diagnose the Main Turbine Trip by multiple Annunciators in alarm, zero generated Megawatts indicated (CL), rapid RCS transient due to the ATWS. The #1 indicator (Annunciator K-1-1) will not come in due to a loss of "B" DC. The crew will diagnose the ATWS. The URO will trip the reactor and perform the Immediate Manual Actions of OP-TM-EOP-001, Reactor Trip. The ARO will perform a symptom check. CRS will drive through OP-TM-EOP-001.

When the IMA's of OP-TM-EOP-001 are complete, symptom check is complete, and the plant is stabilized, the scenario can continue.

Event #5: The Lead Examiner will cue the sheared shaft on RC-P-1A. This will lower RCS flow in the "A" loop. The objective is to shutdown the RCP before any further significant RCP damage occurs.

The crew will diagnose the sheared shaft on RC-P-1A by annunciator F-3-1 in alarm, high vibrations indicated on the Vibration Monitor Panel (PL), multiple PPC points in alarm. The RCP amp indicators will not be of any help due to the loss of "B" DC. When attempting to secure RC-P-1A from CC, it will not secure due to the loss of "B" DC. The decision will be made by the CRS to trip the 1A 7kV bus. This will secure "A" and "C" RCP's, leaving the plant in a 1/1 RCP combination.

When RC-P-1A is deenergized, the scenario can continue.

Event #6/7: The lead examiner will cue OTSG Tube Rupture on "A" OTSG, eventually leading to a Loss of Subcooling Margin.

Both OTSGs are steamed to the condenser until DHR is initiated. Steaming both OTSGs is performed for several reasons:

- Reduces the cooldown time to Decay Heat removal conditions and the potential release duration,
- Minimizes the OTSG tube stress,
- Minimizes total leakage and preserves BWST inventory for further contingencies,
- Minimizes the potential loss of either OTSG used for core cooling, and subsequent need of HPI COOLING.

The preferred approach to steam both OTSGs cannot be maintained under all tube leak scenarios:

- The OTSG must be isolated if OTSG level cannot be maintained < 85% operating range level because liquid may enter the steam lines and result in severe water hammer to steam control valves, with possible loss of OTSG integrity or personnel injury.
- If the projected or actual integrated dose consequence of the event is significant (0.5 R whole body or 1.5 R thyroid) and both OTSGs are available then steaming and feeding of the OTSG with the largest leakage is terminated, the OTSG is isolated and the cooldown will be performed with one OTSG.
- If BWST level is less than 22 ft, then the most affected OTSG is isolated. If BWST continues to decrease to less than 15 ft, then the second OTSG is isolated. The reason for isolation is based on the loss of reactor coolant outside of the reactor building (i.e., where it cannot be recirculated for core cooling). The loss of inventory is a serious threat to core cooling. Action may

be taken to makeup to the BWST to avoid or delay the need to isolate. OTSG isolation is required to preserve enough BWST inventory for Containment sump recirculation mode of core cooling, if needed.

No isolation criteria will be met during the scenario. A loss of Subcooling Margin will occur.

Upon a Loss of Subcooling Margin, the following immediate actions ensure adequate core cooling.

- RC pumps are shutdown to ensure ECCS can be successful for any RCS break.
- HPI / LPI are actuated to ensure core cooling is and operating properly
- EFW is actuated and OTSG level is raised to support boiler condenser cooling mode of OTSG heat removal. OTSG heat removal is required for small breaks where the flow out the break does not remove decay heat.

The crew will diagnose the OTSG Tube Rupture based on RM-G-26, RM-A-5, and RM-A-15 indications (PR) rising, Annunciator C-1-1 in alarm, "A" OTSG pressure and level rising, lowering Subcooling Margin, and/or pressurizer level lowering at a more rapid pace (CC). The crew will perform a symptom check and the CRS will re-enter OP-TM-EOP-005, OTSG TUBE LEAKAGE. The lowering of Subcooling Margin is a relatively slow process, ensuring that the crew is constantly evaluating for entry criteria into other EOP's. Once SCM indicates less than 25°F, the CRS will enter OP-TM-EOP-002, LOSS OF SCM. The URO will secure RCP's by securing 1B 7kV bus (due to a loss of "B" DC) and initiate 4# ES IAW Rule 1.

The ARO will identify that EF-P-2A trips, and that the OTSG's will need to be fed with Main Feedwater IAW Rule 4.

The scenario can be terminated when RCP's are secured, the OTSG's are being fed with Main Feedwater after an EFW actuation, and OP-TM-EOP-005 has been reentered from OP-TM-EOP-002, LOSS OF SCM.

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-1 - Trip All RCPs - requires that the RCPs be tripped within 1 minute of Loss of Sub Cooling Margin, IAW OP-TM-102-106 reference FSAR 14.2.2.4.

Safety Significance: SBLOCA analyses were performed using conservative Appendix K assumptions with the objective of meeting 10 CFR50.46 criteria. These analyses predicted that continued RCP operation, during certain SBLOCAs, could lead to RCS void fractions of 70% if RCPs continued to operate longer than [1 or 2] minutes following initiation of the SBLOCA. The analyses predicted that if RCPs were tripped after these high void fractions occurred, the core would not be adequately covered and fuel clad failure would occur.

Cues:

1. SCM meter reading less than 25F
2. P-T Display and associated alarms
3. Low RCS Pressure alarms

Performance Indicators:

1. Operation of all console RCP trip devices

Feedback:

1. Report by the URO to the crew that RULE 1 has been completed.

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-7 – Minimize SCM - HPI must be throttled to minimize SCM while maintaining margin> 30°F this minimizes primary to secondary leakage and reduces dose on the secondary side of the plant as well as minimizing release to the public. If HPI is allowed to raise OTSG pressure above 1000 psig after OTSG is full, a liquid RCS release to atmosphere would occur. Task failure would be to not throttle and challenge this.

Safety Significance: Except when RCP NPSH limits are applicable and are more restrictive, RCS pressure should be maintained close to, but above, the minimum SCM to minimize RCS-SG ΔP. The reason for minimizing RCS-SG ΔP is to reduce the leak flowrate from primary to secondary to as low as possible. Therefore, this procedure (minimizing SCM) is desirable whenever possible during SGTR mitigation.

Reducing the leak flowrate from the RCS to the secondary side of a SG reduces RCS losses and when accomplished with an impaired steam system (e.g., weeping MSSV and MSL leak) should reduce integrated radiation releases from the impaired system. If the level of the leaking SG can be maintained within normal operating limits, then the SG will remain available for continued use during the cooldown, thus enhancing the transient mitigation capability of the plant.

Cues:

1. SCM monitor
2. SPDS displays and associated alarms
3. P-T display and associated alarms

Performance Indicators:

1. Operation of MU/HPI pump and valve controls
2. Operation of normal or auxiliary spray valve controls

Feedback:

1. SCM meter and/or plant SPDS and/or P-T display
2. RCS pressure and temperature
3. MU/HPI pump and valve status indications
4. Normal and auxiliary spray valve status indications

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-29 – Maintain SG availability - Fulfillment of this CT requires the following: Do not isolate a SG that has a SGTR when steaming of the most affected SG is not required. In this case, feeding and steaming should be stopped but other isolation should not occur. Unnecessarily isolating an OTSG should be considered grounds for failure of the critical task.

Safety Significance: During SGTR mitigation, if steaming and feeding of the most affected tube ruptured SG is terminated, it should be done in a manner that allows restoration of heat transfer to that SG. Flow paths should not be isolated in a manner that involves considerable delay to reestablish. This allows expeditious use of the SG if it its use is subsequently desired.

Cues:

1. Main steam line radiation monitor alarms
2. Local area radiation alarms
3. SPDS and associated alarms
4. P-T display and associated alarms

Performance Indicators:

1. Operation of MFW/EFW valve controls on SG with a tube rupture
2. Operation of TBVs/ADVs controls on SG with a tube rupture

Feedback:

1. RCS pressure and temperature
2. MFW/EFW valve status
3. TBV/ADV valve status

Industry Experience:

- Indian Point 2 (2/15/00) – Steam Generator Tube Failure (380 litres per minute)
- Palo Verde 2 (3/14/93) – Steam Generator Tube Leak ranged between 11 and 39 litres per day, suddenly turned to 900 litres per minute tube rupture.
- TMI Inadvertent ESAS Actuation Due to Operator error (7/2/90)
- OE25328 – Engineered Safeguards Actuation System (ESAS) Relay Failure Contributes to Inadvertant Safety System Actuation (Three Mile Island Unit 1) (6/27/07)

PRA

- Steam Generator Tube Rupture (Initiating Event)
- EF-P-1 loss (Risk Increase Factor)

Event	Description	Procedure Support
	Initial Set-up.	100% Power, MOL
1	20 gpm tube leak on "A" OTSG	OP-TM-EOP-005, OTSG Tube Leakage
		1102-4, power Operations
		Technical Specifications
2	Inadvertent 500# ESAS Signal	OP-TM-AOP-046, Inadvertant ESAS
3	Loss of "B" DC, entry into.	OP-TM-AOP-024, Loss of "B" DC
		Technical Specifications
4	Main Turbine Trip, ATWS	OP-TM-EOP-001, Reactor Trip
5	Sheared shaft on RC-P-1A,	OP-TM-MAP-F0301
		OP-TM-226-151
6	OTSG Tube Rupture on "A" OTSG	OP-TM-EOP-005, OTSG Tube Leakage
		OP-TM-EOP-002, Loss Of 25F Subcooling Margin
		OP-TM-EOP-010, Emergency Procedure Rules, Guides and Graphs
7	EF-P-2A Trips	OP-TM-EOP-010, Emergency Procedure Rules, Guides and Graphs
		OP-TM-424-901, Emergency Feedwater

ACTION	COMMENTS / INSTRUCTIONS	DESCRIPTION
Initialization IC-234	100% HFP ICS full AUTO	Equilibrium XENON
Malfunction RD28	Value: Insert When: Immediately	Reactor Auto-trip disabled
Malfunction RD32	Value: Insert When: Immediately	DSS Auto-trip disabled
Remote MUR12	Value: Open When: Immediately	MU-V-76A/B
Remote MUR13	Value: Closed When: Immediately	MU-V-77A/B
Remote MUR22	Value: Out When: Immediately	MU-P-1C OOS
MU-P-1C Control Switch (CR)	Value: PTL & tagged When: Immediately	MU-P-1C OOS
Remote MUR29	Value: MU-P-1B When: Immediately	MU-P-1B ES Selected
Malfunction TH15A	Value: 0.1 When: Event 1	20 gpm Tube Leak on "A" OTSG
Malfunction ES08A	Value: Insert When: Event 2	Inadvertent 500# ESAS Signal
Malfunction ED08B	Value: Insert When: Event 3	Loss of "B" DC
Malfunction TC01	Value: Insert When: Event 4	Main Turbine trips
Malfunction TH18A	Value: Insert When: Event 5	RC-P-1A Sheared Shaft
Malfunction TH16A	Value: Initial 8*, Final 11 600 second ramp When: Event 6	Tube Rupture on "A" OTSG
Malfunction FW18A	Value: Insert When: Event 7	EF-P-2A Trips
Malfunction FW17	Value: Insert When: Event 8	EF-P-1 Trips
Trigger Event 10	Value: dmf es08a When: zdipb2rc4a==1	Allows 500# ES Signal to be defeated
Remote MSR66	Value: Insert, 180 second delay When: Event 11	Starts Auxiliary Boilers
Remote FWR78	Value: Manual When: Event 12	Places MS-V-13A in Local
Remote FWR79	Value: Final 0, 3 sec Delay, 15 second Ramp When: Event 12	Closes MS-V-13A in Local

ACTION	COMMENTS / INSTRUCTIONS		DESCRIPTION
	Value: When:	Manual Event 13	Places MS-V-13B in Local
	Value: When:	Final 0, 3 sec Delay, 15 second Ramp Event 13	Closes MS-V-13B in Local

*Initial defaults to zero, ensure 8 prior to commencing Event.

Op Test No.:	1	Scenario #	4	Event #	1	Page	15 of 35
Event Description:	20 gpm tube leak on "A" OTSG						

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 1**
Indications Available:		**Increased Makeup flow rate, Lowering Makeup Tank level,Rising counts on RM-A-5, RM-A-15, RM-G-26, Main Annunciator C-1-1 in alarm.**
	Crew	Diagnose a 20gpm tube leak on the "A" OTSG.
EXAMINER'S NOTE:		**The crew may choose to enter MAP-C-1-1 for RM-G-26. The only Manual Action is to Go To OP-TM-EOP-005.**
	CRS	Directs entry into OP-TM-EOP-005, OTSG Tube Leakage
EXAMINER'S CUE:		**As Shift Manager, acknowledge the direction to inform the Shift Dose Assessor to begin offsite dose assessment.**
		OP-TM-EOP-005, OTSG Tube Leakage
	CRS	Step 3.1: Notifies the "Shift Dose Assessor" to begin offsite dose assessment.
	ARO	Step 3.2: Announces OTSG TUBE LEAK on the "A" OTSG.
EXAMINER'S NOTE:		**With a small tube leak such as this, the CRS may direct the ARO to line up to feed from the B RCBT.**
	URO	Step 3.3: Initiates Guide 9, "RCS Inventory Control.

Op Test No.: 1	Scenario # 4	Event # 1			Page 16 of 35		
Event Description:	20 gpm tube leak on "A" OTSG						

Time	Position	Applicant's Actions or Behavior
Booth Operator Cue:		**When directed as an Auxiliary Operator to start both Auxiliary Boilers, acknowledge the order and then INSERT EVENT #11.**
	ARO	Step 3.4: Directs an Auxiliary Operator to start both Auxiliary Boilers.
	CRS	Step 3.8: Determines that the SG/REACTOR DEMAND ICS Control Station is not in AUTO, and IAW the RNO: Directs a reduction in power at a rate within manual control limitations IAW OP-TM-621-471 "ICS Manual Operations".
EXAMINER'S NOTE:		**The crew will be reducing power IAW OP-TM-621-471 while continuing in EOP-005.**
		OP-TM-621-471, ICS Manual Control
	URO	Step 4.6.3: URO Inserts Control Rods placing the Diamond Control Switch (CC) in the Insert direction, and verifying proper response from the CRD System (CC).
		OP-TM-EOP-005, OTSG Tube Leakage
	ARO	Step 3.9: Places both FW-P-1A and FW-P-1B ICS Control Stations in HAND by pressing the white HAND pushbutton for each station, verifying the white HAND light lit and the red AUTO light not lit on each station.
EXAMINER'S CUE:		**As Shift Manager, acknowledge the direction to: Evaluate Emergency Action Levels, NOTIFY Power Team, NOTIFY TSO, and NOTIFY NDO.**
	CRS	Step 3.10: Requests the Shift Manager SM to evaluate Emergency Action Levels, and to notify the Power Team, TSO, and NDO.

Op Test No.:	1	Scenario #	4	Event #	1	Page	17 of 35
Event Description:	20 gpm tube leak on "A" OTSG						

Time	Position	Applicant's Actions or Behavior
Booth Operator Cue:		**When directed as an Auxiliary Operator to place the MS-V-13A handwheel in the Closed position, acknowledge the order, INSERT EVENT #12, and then report in that "The handwheel for MS-V-13A is in the closed position".**
	CRS	Step 3.12: Deteremines that all of the following conditions exist: The affected OTSG is identified, EF-P-1 is not running, and either Motor Driven EFW Pump is Operable, and directs MS-V-13A handwheel to be placed in the Closed position.
	CRS	Declares a 3.1.6.3 (6 Hour) Tech Spec clock.
EXAMINER'S NOTE:		**T.S. 3.1.6.3: If the primary-to-secondary leakage through any one (1) steam generator exceeds 150 GPD, the reactor shall be placed in hot shutdown within 6 hours, and in cold shutdown within 36 hours.**
EXAMINER'S NOTE:		**Once sufficient reactivity manipulation is observed and the T.S. call is made, Go to Event 6.**

Op Test No.:	1	Scenario #	4	Event #	2	Page	18 of 35
Event Description:		Inadvertent 500# ESAS Signal					

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 2**
Indications Available:		**Multiple Main Annunciator Panel Alarms illuminated, MU-P-1A running, ES positions indicated on PCR for "A" Train components.**
	Crew	Diagnosis an Inadvertant ES Actuation, "A Train 500#.
	CRS	Direct entry into OP-TM-AOP-046, Inadvertant ESAS Actuation.
		OP-TM-AOP-046, Inadvertant ESAS Actuation
	URO	Step 2.1 (**IMA**): Defeats invalid ESAS signals by pressing "Enable and Channel Reset" pushbuttons for each of three channels, verifying that the blue "Actuated" light is not lit for each channel and the green "Fully Enabled" light is lit for each channel (CC).
	URO	Step 2.2 (**IMA**): Determines that MU-P-1A is not required for seal injection and secures it by rotating the Control Switch in the counter-clockwise direction and verifying the green flag indicator is visible, and that the green Off light is lit and the red Running light is not lit.
	URO	Step 2.3 (**IMA**): Determines that there are no MU-V-16's with HPI, and does not throttle MU-V-16A and MU-V-16B to maintain MU-P-1A flow > 115 gpm. May close MU-V-16A and MU-V-16B. ?
	ARO	Step 3.1: Announces entry into OP-TM-AOP-046, "Inadvertent ESAS Actuation" over the plant page and radio.
	URO	Step 3.3: Ensures MU-V-36 is Open by pressing the open pushbutton and verifying the red open light is lit and the green closed light is not lit (CC). MU-V-37 is already open, evidenced by red open light lit and green closed light not lit (CC).

Op Test No.:	1	Scenario #	4	Event #	2	Page	19 of 35
Event Description:	Inadvertent 500# ESAS Signal						

Time	Position	Applicant's Actions or Behavior
EXAMINER'S NOTE:		**OP-TM-AOP-046 does not address closing MU-V-16A and MU-V-16B in the current alignment. If not already closed during the IMA's:** **- The CRS may declare a variance with a second SRO's concurrence, to close the valves.** **- Additionally, a path exists through Guide 9 to Rule 2 to OP-TM-211-901 to close the valves.**
	URO	Step 3.12: Ensures MU-V-14A is Closed by pressing the close pushbutton and verifying the green closed light is lit and the red open light is not lit (CC). MU-V-14B is already closed, evidenced by green closed light lit and red open light not lit (CC).
	ARO	Step 3.16: Initiates OP-TM-211-950, "Restoration of Letdown Flow."
		OP-TM-211-950, Restoration of Letdown Flow
	ARO	Reviews Precautions, Limitations, and Prerequisites.
EXAMINER'S NOTE:		**OP-TM-211-950, Steps 4.1-4.4 are N/A.**
	ARO	Step 4.5: Verifies MU-V-3 is closed by the green closed light being lit and the red open light not being lit, closes MU-V-4, verifying green closed light lit and the red open light not lit, Closes MU-V-5 by rotating the dial on MU-V-5 Control Station counter-clockwise until the demand indicates zero (CC).
	ARO	Step 4.6: Verifies MU-V-1A and MU-V-1B are Open by the indicating lights for each being red (not green) (CC)
	ARO	Step 4.7.2: Verifies MU-V-2A and MU-V-2B are Open by the indicating lights for each being red (not green) (CC)
	ARO	Step 4.8.2: Throttles MU-V-5 to 10% open by operating the dial on the MU-V-5 Control Station to the 10 position.

Op Test No.:	1	Scenario #	4	Event #	2	Page	20	of 35
Event Description:	Inadvertent 500# ESAS Signal							

Time	Position	Applicant's Actions or Behavior
	ARO	Step 4.9: Determines MU-V-8 is aligned to the THRU position by the indication THRU TO FILTERS lit and BYPASS indication not lit (CC)
	ARO	Step 4.10.4: Opens MU-V-3 by pressing the open pushbutton and observing the red open light lit and the green closed light not lit (CC)
	ARO	Step 4.13: Raises letdown flow at < 2.5 gpm/min to desired flow by operating the dial on the MU-V-5 Control Station in the clockwise direction to open MU-V-5 gradually.
EXAMINER'S NOTE:		**Once Letdown has been restored, Go to Event 3.**

Op Test No.:	1	Scenario #	4	Event #	3	Page	21 of 35
Event Description:	Loss of "B" DC (TS)						

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner, INITIATE Event 3.**
Indications Available:		**Multiple Main Annunciators in alarm, "Red" CONTR. BLDG. BAT CHGRS B DAMPER TBL FIRE-SMOKE (HVA-3-2) in alarm, Loss of multiple indications throughout the Control Room (listed at end of scenario).**
		HVA, HVA-3-2, CONTR. BLDG. BAT CHGRS B DAMPER TBL FIRE-SMOKE
		Step 1: Initiate OP-TM-AOP-001, Fire, and dispatch fire brigade to the "B" Inverter Room.
Booth Operator Cue:		**When the crew announces the Red Fire Alarm and dispatches the Fire Brigade, call in as an Auxiliary Operator and state: "I'm standing in the B Inverter Room and there is a faint burnt smell in the air but there is no fire or smoke".**
		OP-TM-AOP-001, Fire
	CRS	Step 3.1: Determines the fire alarm is invalid, and goes to Section 4.0, Return to Normal.
	ARO	Step 4.1: Announces "Fire alarm was invalid. There is no fire in (location). Fire Brigade stand down."
	Crew	Diagnoses loss of "B DC.
	CRS	Announces entry into OP-TM-AOP-024, "B" DC SYSTEM FAILURE
		OP-TM-AOP-024, "B" DC SYSTEM FAILURE
	ARO	Step 3.1: Announces entry into OP-TM-AOP-024, "B DC System Failure," over the plant page and radio.

Op Test No.:	1	Scenario #	4	Event #	3	Page	22 of 35
Event Description:	Loss of "B" DC (TS)						

Time	Position	Applicant's Actions or Behavior
EXAMINER'S NOTE:		**1M DC automatic switching capability is defeated when an ES signal comes in and remains defeated until the reset pushbutton is pressed on PCL.**
	ARO	Step 3.2: Determines that "A" DC is operable, and ensures that 1M DC Distribution Panel Power Battery Select switch is in the "A" position by pressing the reset pushbutton below the select switch and then rotating the switch handle counter-clockwise and verifying the "A" DC light is lit and the "B" DC light is not lit (PCR).
Booth Operator Cue:		**When directed as an Auxiliary Operator to investigate event and/or to report "B" DC voltages, state: "Both B and D Battery banks are reading zero volts".**
	CRS	Step 3.3: Determines that both "B" and "D" Battery Banks are de-energized, and announces entry into Section 4.0, "B DC De-energized."
Booth Operator Cue:		**If directed as an Auxiliary Operator to manually close MS-V-13B, INSERT EVENT #13 and then report ": "MS-V-13B is closed locally".**
	CRS	Declares a 3.7.2.g (8 Hours) Tech Spec clock.
EXAMINER'S NOTE:		**T.S. 3.7.2.g: One station battery may be removed from service for not more than eight hours.**
EXAMINER'S NOTE:		**Once the TS call is made and 1M DC is powered from "A" DC, Go to Event 4.**

Op Test No.:	1	Scenario #	4	Event #	4	Page	23 of 35
Event Description:	Main Turbine Trip, ATWS						

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 4.**
Indications Available:		**Multiple Main Annunciators in alarm (except K-1-1 due to loss of B DC, zero generated Megawatts indicated (CL), rapid RCS transient due to ATWS**
EXAMINER'S NOTE:		**The Main Annunciator indication for a Main Turbine trip (MAP-K-1-1) is non-functioning as a result of the loss of "B" DC in the previous event. This makes it much more difficult to diagnose the cause of the current event.**
EXAMINER'S NOTE:		**A 1600# ES actuation may occur. If this does happen, the crew will recognize that HPI is not required and will choose to throttle and/or terminate HPI.**
	Crew	Diagnoses a Turbine Trip and ATWS.
	CRS	Announces entry into OP-TM-EOP-001, Reactor Trip
		OP-TM-EOP-001, Reactor Trip
	URO	Step 2.1 (**IMA**): Presses Both Reactor Trip and DSS pushbuttons (CC).
	URO	Step 2.2 (**IMA**): Verifies that the reactor is shutdown by one of the following: Power Range nuclear instrumentation indicates less than 5% (CC) All control rods are inserted (PC) Source Range count rate is continuously lowering (CC)
	URO	Step 2.3 (**IMA**): Presses the Turbine Trip pushbutton (CL).
	URO	Step 2.4 (**IMA**): Verifies the Turbine Stop valves are closed by observing the indication on CL.

Op Test No.:	1	Scenario #	4	Event #	4	Page	24	of 35
Event Description:		Main Turbine Trip, ATWS						

Time	Position	Applicant's Actions or Behavior
	ARO	Step 3.1: Performs a Symptom Check and recognizes that an OTSG tube leak exists in the"A" OTSG.
	CRS	Step 3.1: Announces transition to OP-TM-EOP-005, OTSG Tube Leakage
EXAMINER'S NOTE:		**The CRS will briefly revisit the steps already performed in EOP-005 to ensure they were completed. These redundant steps are omitted from the scenario. EOP-005 continues below at Step 3.24.**
		OP-TM-EOP-005, OTSG Tube Leakage
	URO	Step 3.24: Verifies control rod groups 1 through 7 are fully inserted by observing all rod bottom lights lit, and that all rods indicate dark lines on the Position Indication Panel (PC)
	ARO	Step 3.26: Announces Reactor Trip.
Booth Operator Cue:		**If directed as an Auxiliary Operator to check MSSV status, report actual status and, if open, continue to monitor and report when all valves are closed.**
	ARO	Step 3.27: Dispatches an Auxiliary Operator to check Main Steam Safety Valves Status, and communicates as necessary to reseat any open valves by lowering pressure in the appropriate OTSG.
	URO	Step 3.33: Minimizes Subcooling Margin IAW Guide 8, RCS Pressure Control
		OP-TM-EOP-010, Guide 8, RCS Pressure Control

Op Test No.:	1	Scenario #	4	Event #	4	Page	25 of 35
Event Description:	Main Turbine Trip, ATWS						

Time	Position	Applicant's Actions or Behavior
	URO	Step 2: Determines that it is required to minimize SCM, and lowers RCS pressure IAW Section B, performing steps sequentially until RCS Press is lowering at the desired rate until one of the following limits is approached: – MAINTAIN SCM > 30 °F – If an RCP is ON, then MAINTAIN RCS pressure above RCP NPSH limits (1102-11 Fig 1 and 1A, or OP-TM-226-000)
	URO	Step B.4: Ensures Pressurizer Heaters are OFF by placing the Control Switch for each bank to the OFF position (CR).
	URO	Step B.5: Determines that a Reactor Coolant Pump is on by the amps indicated, and that RC-V-3 is Open. Throttles Open the Spray Valve, RC-V-1, by turning the Auto/Manual switch (CC) clockwise to the Manual position and then operating the Open and Close pushbuttons (CC) as necessary to lower RCS pressure and to minimize Subcooling Margin.
CT-7	URO	Step B.6: When SCM is between 30 and 70 (specifically determined by the CRS), closes RC-V-1 by pressing the Close pushbutton (CC) until the green closed light is lit and the red open light is not lit.
		OP-TM-AOP-024, "B" DC SYSTEM FAILURE, ATTACH. 3
	ARO	Trips MO-P-1A/B/D/E by rotating each Control Switch counter-clockwise, verifying the green flag is indicated for each pump, and that green light is lit and red light not lit for each pump.
	ARO	STEP 3.40: INITIATE OP-TM-826-901, "Control Building Ventilation System Radiological Event Operations".
		OP-TM-826-901, Control Building Ventilation System Radiological Event Operations
	ARO	Step 4.1.3: Secures AH-E-19A by rotating the control switch counter-clockwise and verifying green light lit, red light not lit (H&V A).

Op Test No.:	1	Scenario #	4	Event #	4	Page	26	of	35
Event Description:		Main Turbine Trip, ATWS							

Time	Position	Applicant's Actions or Behavior
	ARO	Step 4.1.5: Places the control switch for AH-E-93's/94's in the OFF position, verifying the control lights for AH-E-93/94A are not lit.
	ARO	Step 4.1.6: Determines that AH-E-17A was running and starts AH-E-18B by turning the control switch clockwise and verifying the red light lit, green light not lit.
EXAMINER NOTE:		**Once Subcooling Margin has been minimized, Go to Event 5.**

Op Test No.:	1	Scenario #	4	Event #	5	Page	27 of 35
Event Description:	Sheared shaft on RC-P-1A						

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 5.**
Indications Available:		**Main Annunciator F-3-1 in alarm, Multiple PPC alarms, High vibrations indicated for RC-P-1A on the Vibration Monitoring Panel.**
	Crew	Diagnosis Sheared Shaft on "A" Reactor Coolant Pump.
	CRS	Directs entry into OP-TM-MAP-F0301, RC LOOP A FLOW LO
		OP-TM-MAP-F0301, RC LOOP A FLOW LO
	URO	Step 4.0: Determines that the faulty RCP is still in operation and starts RC-P-2A-1 by rotating the control switch in the clockwise direction and observing red light lit, green light not lit, and a red flag indicated (CC).
	URO	Step 4.0: Starts RC-P-3A-1 by rotating the control switch in the clockwise direction and observing red light lit, green light not lit, and a red flag indicated (CC).
	URO	Step 4.0: Goes to OP-TM-226-151 to place RC-P-1A in Standby.
EXAMINER'S NOTE:		**The Control switches for RCP's are non-functioning as a result of the loss of "B" DC in a previous event. OP-TM-AOP-024, "B" DC System Failure, addresses the need to open 6900V Bus feeder breakers.**
		OP-TM-226-151, SHUTDOWN RC-P-1A
	CRS	Step 4.5: Determines that placing RC-P-1A in Pull-To-Lock will not secure RC-P-1A and directs the URO to deenergize 1A 7kV bus.
		OP-TM-AOP-024, "B" DC SYSTEM FAILURE

Op Test No.: 1	Scenario # 4	Event # 5	Page 28 of 35
Event Description:	Sheared shaft on RC-P-1A		

Time	Position	Applicant's Actions or Behavior
	URO	Step 4.12: Deenergizes 1A 7kV bus by: - Observing that breaker 1SA72 has green light lit, red light not lit, green flag indicated (PR) - Opening breaker 1SA-02 by rotating the Control Switch counter-clockwise and verifying that green light lit, red light not lit, green flag indicated (PR), and RCS Loop low flow Annunciators are in alarm after a delay.
EXAMINER'S NOTE:		**Once RC-P-1A has been secured, Go to Event 6.**

Op Test No.:	1	Scenario #	4	Event #	6	Page	29 of 35
Event Description:	OTSG Tube Rupture on "A" OTSG with a Loss of Subcooling Margin						

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 6.**
Indications Available:		**RCS Pressure lowering, Pressurizer level lowering, RM-G-26 counts rising, RM-A-5/15 counts rising, "A" OTSG level rising.**
	Crew	Diagnoses the OTSG Tube Rupture
	ARO	Performs a symptom check, determines OTSG Tube Rupture in "A" OTSG.
	CRS	Re-enters OP-TM-EOP-005, OTSG Tube Leakage
EXAMINER'S NOTE:		**The CRS will briefly revisit the steps already performed in EOP-005 to ensure they were completed. These redundant steps are omitted from the scenario. EOP-005 continues below at Step 3.29.**
		OP-TM-EOP-005, OTSG Tube Leakage
	ARO	Step 3.29: Determines that OTSG A pressure is approaching 1000 psig, and verifies MS-V-2A is Open by red open light lit and green closed light not lit (CC), and then opens MS-V-3D, E, F by adjusting the toggle switch on the MS-V-3D/E/F/4A Control station initially in the upward direction, and then as needed to maintain OTSG pressure < 1000 psig.
CT-29	ARO	Step 3.30: Determines that OTSG level is rising due to tube leakage in an AVAILABLE OTSG ("A" OTSG), and preferentially steams the "A OTSG by adjusting the toggle switch on the MS-V-3D/E/F/4A Control station as needed to maintain "A" OTSG level < 85%.
EXAMINER'S NOTE:		**As the leak gets worse, it will become more difficult to maintain the "A" OTSG available. If proper control of the Turbine Bypass Valves is not executed, the crew will have to isolate the "A" OTSG unnecessarily.**

Op Test No.:	1	Scenario #	4	Event #	6	Page	30	of	35
Event Description:	OTSG Tube Rupture on "A" OTSG with a Loss of Subcooling Margin								

Time	Position	Applicant's Actions or Behavior
	Crew	Diagnoses the Loss of Subcooling Margin
	CRS	Announce entry into OP-TM-EOP-002, Loss of 25 Degrees F Subcooling Margin
		OP-TM-EOP-002, Loss of 25 Degrees F Subcooling Margin
	URO	Step 2.1 (**IMA**): Performs Rule 1, LSCM
EXAMINER'S NOTE:		**RCP's must be secured within one minute of a Loss of Subcooling Margin (Time Critical Action).**
		OP-TM-EOP-010, Rule 1, Loss of Subcooling Margin
CT-1	URO	Step 2: Determines that it has been more than two minutes since RCP start, determines ~~that RCP's cannot be secured~~ from the Console, then determines 1A 6900v bus is deenergized by green light lit, red light not lit, green flag indicated (PR) on both 1SA-02 and 1SA70, and de-energizes 1B 6900v bus by: - Observing that breaker 1SB72 has green light lit, red light not lit, green flag indicated (PR) - Opening breaker 1SB-02 by rotating the Control Switch counter-clockwise and verifying that green light lit, red light not lit, green flag indicated (PR), and RCS Loop low flow Annunciators are in alarm after a delay.
EXAMINER'S NOTE:		**B side ESAS cannot be manually initiated due to the Loss of "B" DC in a previous event. "A" train ES is sufficient to combat the situation.**
	ARO	Initiates 4 # ESAS Actuation on the A Train by pressing the 4# manual ES Actuation pushbutton, and verifying that the blue ES light are lit in their proper order (A side only) (PCR)

Op Test No.: 1	Scenario # 4	Event # 6	Page 31 of 35
Event Description:	OTSG Tube Rupture on "A" OTSG with a Loss of Subcooling Margin		

Time	Position	Applicant's Actions or Behavior
Booth Operator Cue:		**If directed as an Auxiliary Operator to open MS-V-13B, state: "The Handwheel for MS-V-13B is stuck. I cannot open the valve". If directed to open MS-V-13A, state "The Handwheel for MS-V-13A is stuck. I cannot open the valve".**
	ARO	Feeds IAW Rule 4 with Emergency Feedwater.
		OP-TM-EOP-010, RULE 4, Feedwater Control
	ARO	Step 1: Determines that two or more Emergency Feedwater Pumps are not operating, and IAW the RNO, maintains flow to the OTSG's <515gpm by: - Pushing the Manual pushbutton in the Control Station for each EF-V-30 Valve (EF-V-30A/B/C/D) (CL and CC) - Adjusting the toggle switch on each Control Station as necessary to achieve proper flow (CL and CC)
		OP-TM-EOP-002, Loss of 25 Degrees F Subcooling Margin
	CRS	Step 3.5: Directs the URO to perform Attachment 1 "Isolation of possible sources of leakage".
	URO	Attachment 1: Ensures the following valves are closed by pressing the green close pushbutton for each valve and verifying green light lit and red light not lit for each valve: - RC-V-1 (CC) (if not already closed) - RC-V-3 (CC) - MU-V-3 (CC) (if not already closed on an ES interlock) Ensures MU-V-1A and MU-V-1B closed by pressing the red indicating pushbutton for each valve and verifying the red light turns green for each valve.
	CRS	Step 3.13: Announces transition to OP-TM-EOP-005, OTSG TUBE LEAKAGE.
EXAMINER'S NOTE:		**Once all RCP's are secured, ESAS has been initiated, and OTSG's are being fed with EFW, Go to Event 7.**

Op Test No.:	1	Scenario #	4	Event #	7	Page	32	of 35
Event Description:		Loss of Emergency Feedwater.						

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 7.** **If EF-P-1 is running, then INITATE Event 8.**
Indications Available:		**EF-P-2A/B indicate no amps, green and amber lights lit, red light not lit, EF-P-1 indicate zero RPM and zero steam pressure, Multiple Main Annunciator alarms.**
	Crew	Diagnosis Loss of Emergency Feedwater.
	CRS	Directs entry into OP-TM-EOP-010, RULE 4, Feedwater Control
		OP-TM-EOP-010, RULE 4, Feedwater Control
	ARO	Step 2: Determines that SCM is not >25°F and OTSG level Is not between 75 to 85% Operating Range Level, and IAW the RNO: - Feed with a total MFW of >1.0 Mlbm/hr by pushing the white HAND pushbutton on the FW-V-16B ICS Control Station and moving the toggle switch on the Control Station in the upward direction to throttle open FW-V-16B and allow feeding to the "B" OTSG within limits.
EXAMINER'S NOTE:		**If the crew has recovered subcooling margin or has OTSG level between 75 to 85% Operating Range, then they will continue in Rule 4 and feed with Main Feedwater as appropriate.**
EXAMINER'S NOTE:		**Scenario can be terminated when Main Feedwater is being used to feed the "B" OTSG**

Op Test No.:	1	Scenario #	4	Event #	7	Page	33	of	35
Event Description:		Loss of Emergency Feedwater.							

Time	Position	Applicant's Actions or Behavior

Follow-up question highest event entered during scenario

Answer: MA3, Thresholds 1 and 2, or FA1, RCS2.a.1 and RCS2.d.1

MA3 - Failure of Reactor Protection - System Instrumentation to Complete or Initiate an Automatic Reactor Scram Once a Reactor Protection System Setpoint Has Been Exceeded.

EAL Threshold Values:

1. A Reactor Protection System setpoint was exceeded.

AND

2. A successful automatic Reactor Trip did not occur

FA1 - Reactor Coolant System - Loss

EAL Threshold Values:

RCS leakage results in < 25°F Sub-Cooled Margin.

Op Test No.:	1	Scenario #	4	Event #	3	Page	34 of 35
Event Description:	Loss of Emergency Feedwater.						

Time	Position	Applicant's Actions or Behavior

EFFECTS OF LOSS OF "B" DC
EG-Y-1B starts, inoperable (TS 3.7.2.c) due to lack of excitation & no output bkr control power. Air start distributor may be damaged.
Aux boiler unavailable due to loss of control power to feed pumps and fans.
Loss of control power to 1D, 1F, 1K, 1L, 1M, 1S, 1T 480V switchgear feeder and load breakers
Loss of protective relaying fed from DCB until repowered from DC Diesel.
Partial loss of protective relaying for Main Transformers, Aux Transformers, Main Generator and Substation. Loss of DC does not actuate any protective features. Protective features would not actuate if a fault occurred.
The following valves fail open: CA-V-5A (TS 3.6.6), EX-V-16/19A/19B/20A/20B/21A/21B/21C/21D/21E/21F, IA-V-2104A/B, IA-V-26, MU-V-26 (TS 3.6.6), DC-V-2B, NS-V-52B, NS-V-53B
The following valves fail closed: TD-V-9A/B,10A/B,11A/B,12A/B,13AB, AH-V-1A, DC-V-19A/B, DC-V-65B, DH-V-75B/76B, RC-V-40B/41B/42/43/44, RR-V-10B, WDG-V-4, WDG-V-134/135, WDL-V-304, WDL-V-535, CF-V-20A/B, HM-V-01B, HM-V-02B, HM-V-03B, HM-V-04B, HR-V-22B, HR-V-23B
Loss of control power to all RCP breakers.
Shunt Trip on Reactor Trip Breaker CRD-CB-1D is inoperable. (TS 3.5.1.7)
Shunt Trip on Reactor Trip Breaker CRD-CB-1B is inoperable. (TS 3.5.1.7)
VA-V-5B fails close (VA-P-1B suction valve).
MS-V-13A and MS-V-13B fail open. EF-P-1 starts.
Condensate recirc valve CO-V-5, Feedwater Pump recirc valves FW-V-7A/B, and Heater Drain Pump recirc valves HD-V-5A/B/C fail open.
FW/CO counting circuit inop - No autostart of CO-P-1s, CO-P-2s, no auto trip of CO-P-2s or FW-P-1s after a standby CO-P-1 or CO-P-2 start failure, no capability to start CO-P-2s from the control room.
FW-P-1s will not trip remotely. FW-V-1A & FW-V-1B will not automatically close on pump trip. FW-P-1B Speed Change Motor inoperable.
CM-V-2 and CM-V-4 fail closed, rendering RM-A-2 inoperable. (TS 3.1.6.8)

Op Test No.:	1	Scenario #	4	Event #	3	Page	35 of 35
Event Description:	Loss of Emergency Feedwater.						

Time	Position	Applicant's Actions or Behavior

EFFECTS OF LOSS OF "B" DC (cont)
Loss of ESAS Train B manual actuation capability (TS Table 3.5.1).
Loss of control power to 1B, 1E 4160V switchgear feeder and load breakers. (TS 3.3, TS 3.4, TS 3.7).
If Turbine Trips, alarm K-1-1 will not actuate.
Generator output breakers will not open until 30 seconds after turbine trip.
MO-P-1A-F trip on Turbine trip interlock is inoperable.

Facility:	Three Mile Island	Scenario No.: 5	Op Test No.: 10-02 NRC
Examiners:		Operators:	
Initial Conditions:	• (Temporary IC-235)		
	• 100% Power, MOL		
	• MO-P-1C and MO-P-1F are OFF for Chemistry purposes IAW OP-TM-431-403/406		
	• Crane work is occurring on the West side of the Plant to stage new piping		
Turnover:	Maintain 100% Reactor Power		
Critical Tasks:	• FW Flow Control (CT-16)		
	• Maintain RB Radiation Boundary (includes SG tubes) (CT-19)		

Event No.	Malf. No.	Event Type*	Event Description
1	DHR32	TS CRS	BWST level lowers, entry into OP-TM-MAP-E0204
2	RC37A	C CRS C URO	NSCCW Leak in RC-P-1A Motor Air Cooler, entry into OP-TM-MAP-F0201 (URO: Starts DW-P-1)
3	MS12C	C CRS C ARO	Hi Level in Moist. Sep. Tank, entry into OP-TM-MAP-N0201 (ARO: Start MO-P-1C)
4	FW04B	I CRS I URO I ARO	FW Temperature transmitter failure, entry into OP-TM-AOP-070 (URO/ARO: Controls reactivity and feedwater in manual. ARO: Controls Feedwater Flow in manual)
5	RD0153 IC16	TS CRS R URO N ARO	Dropped Safety Rod, runback fails to occur, entry into OP-TM-MAP-H0101, and OP-TM-AOP-062 (URO: Reactivity manipulation, ARO: Feedwater manipulation)
6	RC37A	C CRS C URO C ARO	NSCCW Rupture in RC-P-1A Motor Air Cooler, Loss of NSCCW, Reactor trip, entry into OP-TM-AOP-031, and OP-TM-EOP-001 (URO: Reactor Trip IMA's)
7	TH06	M CRS M URO M ARO	RCS LOCA, Loss of Subcooling Margin, entry into OP-TM-EOP-002.
8	02A6S28 02A6S22	C CRS C URO	NSCCW Containment Isolation valves fail to close on ES signal with low level. (URO: Manually closes NSCCW Containment Valves)

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Three Mile Island NRC Scenario #5

Event #1: When the crew has accepted the watch, the Lead Examiner will cue the lowering level of the BWST due to a crane piercing the tank at the 53.5 ft level. The crew will diagnose the low level in the BWST by lowering level on the BWST level indicators (CC and CR) and annunciator E-3-4 in alarm. Although it initially drops rapidly, the crew will identify it as steady at approximately 53.5 ft.

The CRS will review and declare the following Tech Spec: 3.3.1.1.a.

Once the Tech Spec has been declared, the scenario can continue.

Event #2: The Lead Examiner will cue the NSSCW Leak in RC-P-1A Motor Air Cooler.

The crew will diagnose a NSSCW Leak in RC-P-1A Motor Air Cooler by lowering NSCCW Surge Tank level (LI-800/801 on CC), Annunciators AA-1-2 and F-2-1 in alarm, and/or PPC alarm L2790.

The URO will start DW-P-1 (CC) to stop the drop in NSCCW surge tank level.

Once DW-P-1 is running, the scenario can continue.

Event #3: The Lead Examiner will cue the closure of MO-V-2C. This will create a Hi Level in the "C" Moisture Separator Tank. If the crew does not respond in a timely manner, the water level in the "C" Moisture Separator Tank will rise into the Main Turbine. If MO-T-1A level increases to the MO-V-2A opening setpoint, MO-V-2A will not open. MO-T-1A will completely fill, the moisture separator will flood and DTCS will isolate the CV for MO-T-1A.

The crew will respond IAW OP-TM-MAP-N0201. The ARO will start MO-P-1C to lower water level.

Once MO-P-1C has been started, the scenario can continue.

Event #4: The Lead Examiner will cue the FW Temperature transmitter failure. This will cause an ICS transient, which if not responded to swiftly, will cause a Reactor Trip. The crew will diagnose the ICS failure by a rapid change in RCS pressure, Reactor Power rising, multiple annunciator alarms, and/or changes in indications at multiple ICS stations. Entry into OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET will be required based on RCS pressure not being controlled in ICS AUTO.

"RCS pressure is not being controlled" requires the operator to make a subjective determination, based on their skills, training, and experience. A determination that RCS pressure is being controlled should include the following elements: 1) The reason for the transient is understood 2) RCS pressure response is consistent with the expected response for the event 3) Automatic or manual control in accordance with normal operating procedures is effectively controlling RCS pressure. A conservative assessment (i.e. concluding that RCS pressure is not being controlled) is appropriate when the three conditions above cannot be satisfied. ICS failures are one class of events that can lead to an upset in primary to secondary heat transfer. Most ICS failures can be mitigated by use of the appropriate manual control normal operating procedures.

This is a difficult fault to identify as the PPC does not identify it with an alarm. This entry into OP-TM-AOP-070 is different from the others because the crew will need to establish ICS controls in manual at the Feedwater Pump and Feedwater Valve ICS controllers or risk a Reactor Trip.

Once the plant is stabilized in ICS HAND control, the scenario can continue.

Event #5: The Lead Examiner will cue the dropped safety rod. The crew will diagnose the dropped rod by Annunciators H-1-1 and H-3-2 in alarm, A green light indicating a dropped rod on the Position Indication Panel (PC), and/or a change in indicated reactor power on NI-5 the CRS will enter OP-TM-AOP-062, INOPERABLE ROD. The crew will commence a reactor shutdown with ICS in manual.

The CRS will identify and declare the following Tech Spec: 3.5.2.2.e

Once sufficient reactivity manipulation has occurred and the Tech Spec has been declared, the scenario can continue.

Event #6: The Lead Examiner will cue the NSSCW Rupture in RC-P-1A Motor Air Cooler. It is considered a loss of NSCCW if NSCCW surge tank level reach 1.6 feet and lowering, and the following Critical Safety Functions are affected:

CSF 4, Core Heat Removal: Provide the capability to remove core heat production at all times: **Loss of Nuclear Services cooling function:** RC pumps must shutdown. Natural Circulation will be used RCS heat removal.
CSF 8, Auxiliary Emergency Systems: Provide equipment cooling (closed cooling and ventilation), and other support requirements to accomplish the other Critical Safety Functions. Provide Instrument Air for operation of EFW, ADVs, RCP Support Systems, and some containment isolation valves: **Loss of Nuclear Services cooling function**: Other CSFs are affected as follows: (1) the reliability of safety related power sources and instrumentation system is degraded by the loss of the control building chillers and (2) the reliability of the decay closed pump motors and emergency feed pump motors is degraded by the loss of cooling to the area ventilation coolers.

CSF 10, Chemistry Control: Provide the means to monitor and control primary and secondary water chemistry in order to ensure the long term reliability of plant systems and limit the potential release of radioactive materials: **Loss of Nuclear Services cooling function** would result in the loss of the capability to obtain an RCS or OTSG sample.

The crew will diagnose a NSSCW Leak in RC-P-1A Motor Air Cooler by lowering NSCCW Surge Tank level (LI-800/801 on CC), Annunciators AA-1-2 and F-2-1 in alarm, and/or PPC alarm L2790.

The CRS will enter OP-TM-AOP-031, LOSS OF NUCLEAR SERVICE CLOSED COOLING. The URO will trip the reactor, perform the Immediate Manual Actions of OP-TM-EOP-001, REACTOR TRIP, trip the RCP's, trip the NSCCW Pumps, start MU-P-1A, place MU-P-1B in PTL, and provide cooling to MU-P-1A.
Once DR-P-1A is running (providing cooling for MU-P-1A), then the scenario can continue.

Event #7/8: The lead examiner will cue the RCS LOCA, causing a Loss of Subcooling Margin.

Upon a Loss of Subcooling Margin, the following immediate actions ensure adequate core cooling.

– RC pumps are shutdown to ensure ECCS can be successful for any RCS break.
– HPI / LPI are actuated to ensure core cooling is and operating properly
– EFW is actuated and OTSG level is raised to support boiler condenser cooling mode of OTSG heat removal. OTSG heat removal is required for small breaks where the flow out the break does not remove decay heat.

The crew will diagnose the LOCA and Loss of Subcooling Margin based on Subcooling Margin meters indicating less than 25F (PC), RCS Pressure rapidly lowering, Pressurizer level lowering rapidly, RB Sump level rising rapidly, RB pressure and temperatures rising rapidly, and 1600# and/or 4# ESAS actuation.

The CRS will direct entry into OP-TM-EOP-002, LOSS OF SUBCOOLING MARGIN. The URO will secure all RCP's using Rule 1.

The URO will identify that NSCCW containment isolation valves, NS-V-4 and/or NS-V-15, and NS-V-35 failed to close on high RB pressure and closes the valves from the pushbuttons on CC IAW OP-TM-244-901, Containment Isolation.

The scenario can be terminated when OP-TM-EOP-006 has been entered and NSCCW Containment Isolation valves have been closed.

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-16 – FW Flow Control – Requires properly controlling EFW and MFW to mitigate excessive primary to secondary heat transfer and securing FW flow to affected SG(s) if any SG operating level > [SG high level]. The GEOG prescribes performance of this CT for situations where too much FW flow exists. Such situations can cause excessive primary to secondary heat transfer and/or damage to plant equipment.

Safety Significance: Following shutdown of the reactor and main turbine, feedwater flow and SG levels should be checked because if the feedwater system is still operating at full capacity (not normal situation following a reactor trip), possible carryover and main steam line flooding can occur within one minute of reactor trip. It is also necessary to ensure proper feedwater flow exists for conditions other than immediate post-trip.
Secondary plant protection systems may actuate automatically during an extended or rapid overcooling. Should this occur, it is necessary to verify whether or not these systems have actuated properly and, if not, to perform the appropriate actions manually.

Cues:

1. [SG high level] alarm
2. SPDS displays and associated alarms
3. P-T display and associated alarms
4. HSPS alarms
5. Verbal alert by plant staff that FW flow rates are excessive

Performance Indicators:

1. Operation of MFW/EFW pump controls
2. Operation of associated MFW/EFW valve controls
3. Operation of [secondary plant protection system] controls

Feedback:

1. RC temperature and pressure
2. SG level and pressure
3. Verbal notification by plant staff of FW flow rates
4. HSPS status indication
5. MFW/EFW pump status indications
6. Associated MFW/EFW valve status indications

B&W Unit EOP Critical Task Description Document, 47-1229003-04:

CT-19 - Maintain RB Radiation Boundary (includes SG tubes) - If RB isolation and cooling, and/or RB spray systems do not actuate when their automatic start setpoints are reached without actuation, then manual actuation and alignement is required.

Safety Significance: Operating the RB emergency cooling system will decrease the RB pressure and temperature. Operating the RB spray system will reduce RB pressure and temperature. RB spray is expected to scrub airborne fission products from the RB atmosphere and retain them in the sump water. Operation of the RB isolation system assures containment integrity.

Cues:

1. ESAS RB isolation & cooling alarms
2. High RB pressure alarms
3. SPDS displays and associated alarms

Performance Indicators:

1. Operation of RB isolation controls

Feedback:

1. RB isolation valve status indication

Industry Experience:

- OE22275 - Reactor Coolant System (RCS) Leak Near ¾" Bypass Line On 2HV-8701B (Vogtle Unit 2) (3/20/06)
- OE29538 – Potential Inadequate Controls of Reactor Coolant System (RCS) Leak Path (Oconee Nuclear Station –ONS) (8/3/09)
- IRS 6380 – Primary Coolant Leak Caused by Rupture of a Makeup Pipe (Kola Unit 2) (3/3/94)

PRA

- Small LOCAs (Initiating Event)
- Feedwater Transient (Initiating Event)

Event	Description	Procedure Support
	Initial Set-up.	100% Power, MOL
1	BWST level lowers	OP-TM-MAP-E0204, BWST Level Lo
		Technical Specifications
2	NSCCW Leak in RC-P-1A Motor Air Cooler,	OP-TM-MAP-F0201, RCP A Motor Trouble
3	MO-V-2C Fails Closed, Hi Level in Moisture Separator Tank	OP-TM-MAP-N0201, MOIST SEP DRN TNK LEVEL HI
4	FW Temperature transmitter failure	OP-TM-AOP-070, Primary To Secondary Heat Transfer Upset
5	Dropped Safety Rod, runback fails to occur	OP-TM-MAP-H0101, ICS Runback
		OP-TM-AOP-062, Inoperable Rod
		Technical Specifications
6	NSCCW Rupture in RC-P-1A Motor Air Cooler, Loss of NSCCW, Reactor trip	OP-TM-AOP-031, Loss Of Nuclear Services Component Cooling
		OP-TM-EOP-001, Reactor Trip
7	RCS LOCA, Loss of Subcooling Margin, entry into OP-TM-EOP-002.	OP-TM-EOP-002, Loss of Subcooling Margin
		OP-TM-EOP-010, Emergency Procedure Rules, Guides and Graphs
8	NSSCW Containment Isolation valves fail to close on ES signal with low level.	OP-TM-EOP-010, Emergency Procedure Rules, Guides and Graphs

ACTION	COMMENTS / INSTRUCTIONS	DESCRIPTION
Initialization IC-235	100% HFP ICS full AUTO	Equilibrium XENON
Malfunction IC52	Value: Insert When: Immediately	SASS Channel Failure – FW Temperature
Malfunction IC58A	Value: Insert When: Immediately	SASS Channel Failure – FW Loop A Flow
Malfunction IC58B	Value: Insert When: Immediately	SASS Channel Failure – FW Loop B Flow
Malfunction IC16	Value: Insert When: Immediately	Runback fails to automatically occur.
Remote DHR32	Value: Final 86 Ramp of 20 When: Event 1	BWST Level Lowers to 54"
Malfunction MS12C	Value: Insert When: Event 3	MO-V-2C Fails Closed, MO-T-1C Hi Level
Malfunction FW04B	Value: 0 When: Event 4	FW Temperature Transmitter Failure
Malfunction RD0153	Value: Insert When: Event 5	Dropped Rod, Group 4, Rod 7
Trigger #6	Value: mmf RC37A 100 When: Event 6	NSCCW Rupture into RC-P-1A, Loss of NSCCW
Malfunction TH06	Value: 0.25 When: Event 7	LOCA
Override 02A6S28-ZDIPB1LDA ON	Value: On When: Event 7	NSSCW Containment Isolation Valves Fail to Close on ES
Override 02A6S28-ZLOPB1LDA(1) AMB	Value: On When: Event 7	NSSCW Containment Isolation Valves Fail to Close on ES
Override 03A6S22-ZDIPB1LDB ON	Value: On When: Event 7	NSSCW Containment Isolation Valves Fail to Close on ES
Trigger Event 8	Value: Insert When: dhndhp1b > 0.1	NSSCW Containment Isolation Valves Fail to Close on ES
Override 02A6S28-ZLOPB1LDA(2) BLUE	Value: On When: Event 7	NSSCW Containment Isolation Valves Fail to Close on ES

ACTION	COMMENTS / INSTRUCTIONS	DESCRIPTION
Override 03A6S22-ZLOPB1LBB(2) BLUE	Value: On When: Event 7	NSSCW Containment Isolation Valves Fail to Close on ES
Malfunction RC37A	Value: 50 When: Event 2	NSCCW Leak into RC-P-1A

Op Test No.:	1	Scenario #	5	Event #	1	Page	11 of 29
Event Description:	BWST level lowers (TS)						

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 1**
Indications Available:		**Main Annunciator E-3-4 in alarm, BWST digital indicators (LI-808-A/B) lower until approximately 54', PPC Points A0486 and A0487 lower until approximately 54'.**
	Crew	Diagnosis a lowering of BWST level, and stabilizing at approximately 54'.
	CRS	Directs entry into OP-TM-MAP-E0304, BWST TEMP/LVL HI/LO.
Booth Operator Cue:		**If directed, as an Auxiliary Operator and/or Maintenance, to investigate the BWST level lowering, report that "The crane working near the BWST has swung its' load into the BWST and pierced it at approximately 54 feet up. There is no visual indication of further water coming out of the hole in the BWST".**
		OP-TM-MAP-E0304, BWST TEMP/LVL HI/LO
	ARO	Step 4.1.1: Determines that console and computer level indications are accurate.
	CRS	Step 4.1.5: Determines that BWST level indication is less than 56.0 ft and Reactor is not shutdown, and declares entry into TS 3.3.1.1.a. (1 hour).
EXAMINER'S NOTE:		**T.S. 3.3.1.1.a: The borated water storage tank (BWST) shall contain a minimum of 350,000 gallons of water having a minimum concentration of 2,500 ppm boron at a temperature not less than 40°F. If the boron concentration or water temperature is not within limits, restore the BWST to OPERABLE within 8 hrs. If the BWST volume is not within limits, restore the BWST to OPERABLE within one hour. Specification 3.0.1 applies.**

Op Test No.:	1	Scenario #	5	Event #	1	Page	12 of 29
Event Description:	BWST level lowers (TS)						

Time	Position	Applicant's Actions or Behavior

EXAMINER'S NOTE:	**Once the Tech Spec is called, Go to Event 2.**

Op Test No.:	1	Scenario #	5	Event #	2	Page	13 of 29
Event Description:	NSCCW Leak in RC-P-1A Motor Air Cooler						

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 2**
Indications Available:		**Lowering level on Nuclear Services Closed Cooling Water (NSCCW) Surge tank indicators (LI-800/801 on CC), Annunciators AA-1-2 and F-2-1 in alarm, and/or PPC alarm L2790.**
	Crew	Diagnosis a NSCCW leak in RC-P-1A Motor Air Cooler and a ground on RC-P-1A.
	CRS	Direct entry into OP-TM-MAP-F0201, RCP A Motor Trouble, and also OP-TM-MAP-F018, NS Surge Tank Level Hi/Lo based on approaching criteria.
EXAMINER'S NOTE:		**The CRS will make the decision to enter Alarm response F-1-8 based on approaching criteria. This decision is made to mitigate the event because if the alarm actuates at setpoint, a Reactor Trip is required. The actions taken (starting DW-P-1) will mitigate the need for tripping the reactor.**
		OP-TM-MAP-F018, NS Surge Tank Level Hi/Lo
	URO	Step 4.2.1: Determines DW-P-1 is available, and MAINTAIN NS-T-1 level IAW OP-TM-541-462 , NS-T-1 Level Control.
		OP-TM-541-462 , NS-T-1 Level Control. to establish M/M
	URO	Step 4.1: Starts DW-P-1 by rotating the Control Switch on CC in the clockwise direction, observing red flag indication, red light lit, green light not lit, and NSCCW surge tank not lowering.
EXAMINER'S NOTE:		**Although the crew may pursue securing RC-P-1A per alarm response, these actions are not required in order to continue with the scenario, and are not desired due to the leak increasing in Event #6.**
		OP-TM-MAP-F0201, RCP A Motor Trouble

Op Test No.:	1	Scenario #	5	Event #	2	Page	14 of 29
Event Description:	NSCCW Leak in RC-P-1A Motor Air Cooler						

Time	Position	Applicant's Actions or Behavior
	URO	Step 4.0: Determines that PPC Point L2790 is in alarm, and performs OP-TM-226-151, Shutdown of RC-P-1A, to place RC-P-1A in Standby mode.
EXAMINER'S NOTE:		**Once DW-P-1 is running, Go to Event 3.**

Op Test No.:	1	Scenario #	5	Event #	3	Page	15 of 29
Event Description:	Hi Level in Moisture Separator Tank						

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner, INITIATE Event 3.**
Indications Available:		**Main Annunciator N-2-1 in alarm, PPC Point L2216 in alarm, MO-V-2C indication as follows: red light not lit, green light lit.**
	Crew	Diagnoses a Hi level in the "C" Moisture Separator Tank.
	CRS	Directs entry into OP-TM-MAP-N0201, MOIST SEP DRN TNK LEVEL HI.
		OP-TM-MAP-N0201, MOIST SEP DRN TNK LEVEL HI
	ARO	Step 4.1: Ensures that the moisture separator drain pump, MO-P-1C, is running by rotating the Control Switch in the clockwise direction and verifying that red flag is indicated, red light lit, and green light not lit (CL). Verifies that discharge valves MO-V-1C is Open by red light lit, green light not lit (CL).
Booth Operator Cue:		**If directed, as an Auxiliary Operator to check levels and ensure MO-V-2C, acknowledge the order, there are no actions to take as MO-V-2C will remain stuck.** **If contacted a second time in regards to MO-V-2C, then state: "MO-V-2C is stuck in the closed position, I cannot get it to move".**
		typo
EXAMINER'S NOTE:		**Once MO-P-1C is running and MO-V-1C is open, the "C" Moisture Separator Tank level will lower through MO-V-1C, and Main Annunciator alarm, N-2-1, will clear.** **There is no need, however, to wait for N-2-1 to clear prior to moving on with the scenario.**
EXAMINER'S NOTE:		**Once MO-P-1C is running, Go to Event 4.**

Op Test No.: 1	Scenario # 5	Event # 4			Page 16 of 29		
Event Description:	FW Temperature Transmitter failure						

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 4.**
Indications Available:		**Main Annunciators H-1-2, H-1-3, H-1-4, H-2-1, and H-2-5 in alarm, a rapid change in RCS pressure, Reactor Power rising, and/or changes in indications at multiple ICS stations.**
	Crew	Diagnoses loss of FW Temperature Transmitter Failure.
	CRS	DIRECTS entry into OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET
		OP-TM-AOP-070, PRIMARY TO SECONDARY HEAT TRANSFER UPSET
	URO	Step 2.1 (**IMA**): Places the Diamond Station in Manual by pressing the Manual/Auto pushbutton on the Diamond Panel and observing the Manual light is lit and the Auto light is not lit (CC).
	URO	Step 2.2 (**IMA**): Places SG A FW Demand and SG B FW Demand ICS Stations in HAND by pressing the HAND pushbuttons on each ICS Station and verifying the white HAND lights are lit and the red AUTO lights are not lit on the selected ICS stations (CC). Determines that FW flow and Tave cannot be stabilized using the FW Demands and goes to the RNO.
EXAMINER'S NOTE:		**The crew should recognize when "A" and "B" OTSG BTU Limit Annunciators are in alarm that the FW Masters will not respond. The ARO will need to control feedwater at the next Control Station level, pumps and valves.**

Op Test No.:	1	Scenario #	5	Event #	4	Page	17	of 29
Event Description:	FW Temperature Transmitter failure							

Time	Position	Applicant's Actions or Behavior
	URO	Step 2.2 RNO(**IMA**): Places A FW Pump, B FW Pump, FW-V-17A, FW-V-17B, FW-V-16A, and FW-V-16B ICS Stations in HAND by pressing the HAND pushbuttons on each ICS Station and verifying the white HAND lights are lit and the red AUTO lights are not lit on the selected ICS stations (CL and CC). Adjusts as necessary to stabilize Tave.
	URO	Step 2.3 (**IMA**): Verifies Turbine Header Pressure is between 835 and 935 psig as read on the Turbine Header Pressure digital indication (CL)
	URO	Step 2.4 (**IMA**): Verifies RCS Pressure is lowering and/or less than 2205 PSIG by observing RCS pressure meters (CC and PC). As required, if RCS Pressure is >2205 psig, URO places RC-V-1 control in Manual (CC), opens RC-V-1 fully by pressing the open pushbutton and observing the red open light lit and the green closed light not lit (CC), and then places RC-V-1 control back to AUTO.
EXAMINER'S NOTE:		**OP-TM-AOP-070, steps 3.1 and 3.2 are IAAT's that should not be applicable during this Event.**
	CRS	Step 3.3: Verifies the Main Turbine is reset by observing it on-line (CL).
	CRS	Step 3.4: Assigns manual control responsibilities and control bands as follows:
	URO	Step 3.4: INSERT or WITHDRAW rods to maintain Reactor power within 1% of current power level by operating the Control Rod switch on the Diamond Panel as applicable (CC).
	ARO	Step 3.4: Adjust FW Flow to maintain Tavg within 2 °F of current temperature by adjusting A FW Pump, B FW Pump, FW-V-17A, FW-V-17B, FW-V-16A, and FW-V-16B ICS Station toggle switches as applicable (CL and CC).

Op Test No.:	1	Scenario #	5	Event #	4	Page	18 of 29
Event Description:	FW Temperature Transmitter failure						

Time	Position	Applicant's Actions or Behavior
	ARO	Step 3.4: Maintain Turbine Hdr Pressure within 10 psig of current pressure by adjusting Turbine Load Set Station demand as applicable (CC).
	CRS	Step 3.5: If not already in 1102-4 for securing RC-P-1A or for BWST T.S. limits, and if Reactor Power was reduced >3%, then initiates 1102-4, Power Operations.
	URO	Step 3.6: Ensures SG/Reactor Demand Station is in HAND by pressing the HAND pushbutton and observing white HAND light is lit and red AUTO light is not lit.
	URO	Step 3.6: Ensures Reactor Demand Station is in HAND by pressing the HAND pushbutton and observing white HAND light is lit and red AUTO light is not lit.
	URO	Step 3.6: Ensures SG A/B Load Ratio Demand Station is in HAND by pressing the HAND pushbutton and observing white HAND light is lit and red AUTO light is not lit.
	URO	Step 3.6: Observes that the ULD ICS Station is already in HAND by the white HAND light being lit.
	CRS	Step 3.7: Verifies that MFW Pumps are controlling FW Valve dP greater than 30 psid (CL) and that Reactor Power is greater than 75% (CC).
EXAMINER'S NOTE:		**OP-TM-AOP-070, step 3.8 is N/A and 3.9 has already been verified.**
	ARO	Step 3.10: Maintains RCS pressure between 2105 and 2205 psig by adjusting A FW Pump, B FW Pump, FW-V-17A, FW-V-17B, FW-V-16A, and FW-V-16B ICS Station toggle switches as applicable (CL and CC).

Op Test No.:	1	Scenario #	5	Event #	4	Page	19 of 29
Event Description:	FW Temperature Transmitter failure						

Time	Position	Applicant's Actions or Behavior
	ARO	Step 3.11: Maintains RCS Tavg 578 to 580 °F, and controls RCS ΔTc < 5° F by adjusting A FW Pump, B FW Pump, FW-V-17A, FW-V-17B, FW-V-16A, and FW-V-16B ICS Station toggle switches as applicable (CL and CC).
	CRS	Step 3.12: Determines that FW Valves are in HAND and initiates OP-TM-421-451 (452), "Manual Control of Feed Flow to A (B) OTSG."
EXAMINER'S NOTE:		**OP-TM-AOP-070, step 3.13 is N/A.**
EXAMINER NOTE:		**If the faulted instrument is identified, the crew may decide to select the alternate instrument, but the alternate instrument will not be able to be selected.**
EXAMINER NOTE:		**Once AOP-070 Actions are complete, and the plant is stable, Go to Event 5.**

Op Test No.:	1	Scenario #	5	Event #	5	Page	20 of	29
Event Description:	Dropped Safety Rod, runback fails to occur (TS)							

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 5.**
Indications Available:		**Main Annunciators G-2-1, G-2-3, and G-3-4 in alarm, Dropped Rod (Group 4, Rod 7) indication on PIP, Lower Reactor Power indication.**
	Crew	Diagnosis Dropped Rod and Runback failing to occur.
	CRS	Directs entry into OP-TM-AOP-062, Inoperable Rod.
		OP-TM-AOP-062, Inoperable Rod
	CRS	Step 3.1: Records time of discovery of inoperable rod.
EXAMINER'S NOTE:		**If the CRS requests from the Shift Manager to have the duty reactor engineer report to the control room, acknowledge the request.**
EXAMINER'S NOTE:		**The steps of AOP-062 are in printed in order in this scenario. To avoid confusion, the actions for power reduction IAW 1102-4 are found on page 22.**
	CRS	Step 3.9 determines that reactor power is not < 60% of the allowable power for the operating RCPs and IAW the RNO: Performs a reactor power reduction IAW 1102-4.
EXAMINER'S NOTE:		**If the CRS requests from the STA to verify quadrant power tilt is less than COLR Table 1 limit, imbalance less than the COLR Figure limits, and/or Rod Index above COLR Limit, then have the STA acknowledge. All will be in the acceptable range.**
EXAMINER'S NOTE:		**The rod will not be recovered.**

Op Test No.:	1	Scenario #	5	Event #	5	Page	21 of 29
Event Description:	Dropped Safety Rod, runback fails to occur (TS)						

Time	Position	Applicant's Actions or Behavior
	CRS	Step 3.14: Determines that the affected rod is a dropped rod, and directs the URO to perform Attachment 1.
EXAMINER'S NOTE:		**If discussed, state: "Nuclear Engineering is informing you that there are no hold points necessary for the dropped rod".**
	CRS	Step 3.15: Determines that the control rod remains misaligned and declares entry into TS 3.5.2.2.e (2 hours). Discusses: - Performing 1430-RPS-3 "RPS Flux /Flow/ Delta Flux Trip Setpoint Adjustment" and reducing the overpower trip setpoint to 70% of the thermal power allowable within 10 hours of discovery. - Performing 1103-15A Section 3.2 to verify adequate shutdown margin once every 12 hours. - Performing OP-TM-622-201 "Control Rod Movement" once within first 24 hours and weekly thereafter. - Ensuring Reactor Engineering confirms the following within 72 hours of discovery: Verifying the potential ejected rod worth is within the assumptions of the ERW analysis, and verifying peaking factors FQ(Z) and FN□H are within COLR limits.

Op Test No.:	1	Scenario #	5	Event #	5	Page	22	of 29
Event Description:	Dropped Safety Rod, runback fails to occur (TS)							

Time	Position	Applicant's Actions or Behavior
EXAMINER'S NOTE:		**T.S. 3.5.2.2.e: If a control rod in the regulating or safety rod groups is declared inoperable per 4.7.1.2, and cannot be aligned per 3.5.2.2.f, power shall be reduced to ≤ 60% of the thermal power allowable for the reactor coolant pump combination within 2 hours, and the overpower trip setpoint shall be reduced to ≤ 70% of the thermal power allowable within 10 hours. Verify the potential ejected rod worth (ERW) is within the assumptions of the ERW analysis and verify peaking factor (FQ(Z) and FNΔH) limits per the COLR have not been exceeded within 72 hours.**
T.S. 4.7.1.2: If a control rod is misaligned with its group average by more than an indicated nine inches, the rod shall be declared inoperable and the limits of Specification 3.5.2.2 shall apply. The rod with the greatest misalignment shall be evaluated first. The position of a rod declared inoperable due to misalignment shall not be included in computing the average position of the group for determining the operability of rods with lesser misalignments.		
		1102-4, Power Operations
	CRS	Step 3.3.2.A.2.c): Recognizes that SG/REACTOR DEMAND is in HAND, and has the URO REDUCE reactor power IAW OP-TM-621-471 "ICS Manual Control"
		OP-TM-621-471, ICS Manual Control
	URO	Step 4.6.3: URO Inserts Control Rods placing the Diamond Control Switch (CC) in the Insert direction, and verifying proper response from the CRD System (CC).
EXAMINER'S NOTE:		**Once sufficient reactivity manipulation is observed and the Tech Spec is declared, Go to Event 6.**

Op Test No.:	1	Scenario #	5	Event #	6	Page	23 of 29
Event Description:	NSCCW Rupture in RC-P-1A Motor Air Cooler, Loss of NSCCW						

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 6.**
Indications Available:		**Lowering level on NSCCW Surge tank indicators (LI-800/801 on CC), Annunciators AA-1-2 and F-2-1 in alarm (if cleared), and/or PPC alarm L2790.**
	Crew	Diagnoses the loss of the NSCCW.
EXAMINER'S NOTE:		**Alarm response F-1-8 alarms at 1.6 feet in the NSCCW Surge Tank.**
	CRS	Directs entry into OP-TM-MAP-F0108, NS SURGE TANK LEVEL HI/LO
		OP-TM-MAP-F0108, NS SURGE TANK LEVEL HI/LO
	CRS	Step 4.1: Determines that NS-T-1 level is less than 1.6 ft. and lowering (LI-800/801 on CC), and initiates OP-TM-AOP-031, "Loss of NS Component Cooling".
		OP-TM-AOP-031, Loss of Nuclear Services Component Cooling
	ARO	Step 3.1: Announces the following over the plant page and radio: "Entering AOP-031, Loss of Nuclear Services Component Cooling. Tripping the reactor and initiating Emergency Feedwater."
	URO	Step 3.2:Initiates EOP-001, "Reactor Trip".
		OP-TM-EOP-001, Reactor Trip
	URO	Step 2.1 **(IMA)**: Presses Both Reactor Trip and DSS pushbuttons (CC).

Op Test No.:	1	Scenario #	5	Event #	6	Page	24 of 29
Event Description:	NSCCW Rupture in RC-P-1A Motor Air Cooler, Loss of NSCCW						

Time	Position	Applicant's Actions or Behavior
	URO	Step 2.2 (**IMA**): Verifies that the reactor is shutdown by one of the following: Power Range nuclear instrumentation indicates less than 5% (CC) All control rods are inserted (PC) Source Range count rate is continuously lowering (CC)
	URO	Step 2.3 (**IMA**): Presses the Turbine Trip pushbutton (CL).
	URO	Step 2.4 (**IMA**): Verifies the Turbine Stop valves are closed by observing the indication on CL.
	ARO	Step 3.1: Performs a Symptom Check and recognizes that no symptoms exist at this time.
CT-16	ARO	Control Feedwater Valve and Pump stations in manual to lower total feedwater, avoiding an excessive cooling event.
		OP-TM-AOP-031, Loss of Nuclear Services Component Cooling
	URO	Step 3.3: Shuts down all Reactor Coolant pumps by rotating the Control Switch for each pump in the counter-clockwise direction and verifying green flag indicated, green light lit, red light not lit for each pump (CC) and loop low flow Main Annunciators in alarm for each loop, as well as verifying that an Oil Lift pump and Backstop Oil pump running by red light on, green light off for each pump (CC).
	URO	Step 3.4.1: Places Nuclear Service Pumps (NS-P-1A and NS-P-1C) in Pull-to-Lock by rotating the Control Switch for each pump in the counter-clockwise direction full and by simultaneously pulling upward on the switch until locked in an elevated position, verifying by black flag indicator, and the red, green, and amber lights not lit for each pump (CC and CR).

Booth Operator Cue: **If directed, as an Auxiliary Operator to close IA-V-49 and open NS-V-100, acknowledge the order. No action is required for the scenario.**

Op Test No.:	1	Scenario #	5	Event #	6	Page	25 of 29
Event Description:	NSCCW Rupture in RC-P-1A Motor Air Cooler, Loss of NSCCW						

Time	Position	Applicant's Actions or Behavior
	ARO	Step 3.4.2 and 3.4.3: Directs an Auxiliary Operator to close IA-V-49, located in FHB 348: west wall by NS-T-1, and to open NS-V-100, located in FHB 348: On top of NS-T-1.
	ARO	Step 3.6.1: Determines that MU-P-1A is available and that both MU-V-77A and MU-V-77B are open, and then starts DC-P-1A by rotating the Control Switch in the clockwise direction and verifying red flag indicator, red light lit, green light not lit (CC).
	ARO	Step 3.6.2: Starts MU-P-1A by rotating the Control Switch in the clockwise direction and verifying red flag indicator, red light lit, green light not lit (CC).
	ARO	Step 3.6.3: Places MU-P-1B in Pull-to-Lock by rotating the Control Switch in the counter-clockwise direction full and by simultaneously pulling upward on the switch until locked in an elevated position, verifying by black flag indicator, and the red, green, and amber lights not lit (CR).
	ARO	Step 3.6.4: Starts DR-P-1A by rotating the Control Switch in the clockwise direction and verifying red flag indicator, red light lit, green light not lit (CC).
EXAMINER'S NOTE:		**Once DR-P-1A is running, Go to Event 7.**

Op Test No.:	1	Scenario #	5	Event #	7,8	Page	26	of	29
Event Description:	RCS LOCA, Loss of Subcooling Margin								

Time	Position	Applicant's Actions or Behavior
Booth Operator Instructions:		**When directed by the Lead Examiner INITIATE Event 7.**
Indications Available:		**Multiple Main Annunciators in alarm, RSC Pressure lowering, Pressurizer level lowering, Makeup Tank level lowering, ESAS actuation, Reactor Building Pressure rising, RB sump level rising, Subcooling Margin indications lowering.**
EXAMINER'S NOTE:		**IAW OS-24, Conduct of Operations During Abnormal and Emergency Events, Step 4.7.2 Determination of Core Subcooling Margin (SCM) (or Superheat):** **2. If any of the following conditions exist:** **o All RCPs are shutdown and natural circulation has not been verified in both loops** **then USE incore subcooling margin C4008 (or C4132).** **If the students use TI-977/TI-978 (PC), they will be basing their decision on invalid indications.**
	ARO	Step 3.1: Performs a Symptom Check and recognizes that a Loss of Subcooling Margin exists based on: • Subcooling Margin on the PPC less than 25F.
		OP-TM-EOP-002, Loss of 25 Degrees F Subcooling Margin
	URO	Step 2.1 (**IMA**): Performs Rule 1, LSCM
EXAMINER'S NOTE:		**Reactor Coolant Pumps are already secured.**
		OP-TM-EOP-010, Rule 1, Loss of Subcooling Margin
	ARO	Step 3: Initiates 4 # ESAS Actuation by pressing the 4# manual ES Actuation pushbuttons (CC and CR), and verifying that the blue ES light are lit in their proper order (PCR)

Op Test No.:	1	Scenario #	5	Event #	7,8	Page	27 of 29
Event Description:	RCS LOCA, Loss of Subcooling Margin						

Time	Position	Applicant's Actions or Behavior
	Crew	Step 4: Initiates OP-TM-424-901, "Emergency Feedwater" and feeds IAW Rule 4.
		OP-TM-EOP-010, Rule 4, Feedwater Control
CT-16	ARO	Steps 1 and 2: Determines all EFW Pumps are operating based on conditions (CL and CC). Determines that Subcooling Margin is not greater than 25F, and that OTSG level is not between 75% and 85%, and then IAW RNO, determines that OTSG tube leakage does not exist and feeds with EFW at >215gpm per OTSG by pushing the manual pushbutton on the controller for each EF-V-30 valve (EF-V-30A-D on CL and CC) and then operating the toggle switch on each controller as required to feed the OTSG's within limits.
		OP-TM-EOP-002, Loss of 25 Degrees F Subcooling Margin
	CRS	Step 3.5: Directs the URO to perform Attachment 1 "Isolation of possible sources of leakage".
	URO	Attachment 1: Ensures the following valves are closed by pressing the green close pushbutton for each valve and verifying green light lit and red light not lit for each valve: - RC-V-1 (CC) (if not already closed) - RC-V-3 (CC) - MU-V-3 (CC) (if not already closed on an ES interlock) Ensures MU-V-1A and MU-V-1B closed by pressing the red indicating pushbutton for each valve and verifying the red light turns green for each valve.
	CRS	Step 3.15 Announces transition to EOP-001, VSSV.

Op Test No.:	1	Scenario #	5	Event #	7,8	Page	28 of 29
Event Description:	RCS LOCA, Loss of Subcooling Margin						

Time	Position	Applicant's Actions or Behavior
EXAMINER'S NOTE:		**IAW OS-24, Conduct of Operations During Abnormal and Emergency Events, Step 4.2.A:** **Licensed operators may take action without procedural guidance, and without taking a variance under the following conditions:** **- Action taken to directly compensate for the failure of an automatic system.** **This states that the URO may recognize the NSCCW Containment Isolation Valves did not close automatically, and may close them immediately. If this is the case, then it is described in the last step of the scenario. Otherwise, the path to isolation is described below.**
		OP-TM-EOP-001, Reactor Trip
	CRS	Step 3.15: Directs the URO to initiate OP-TM-642-904 "Reactor Trip Isolation ESAS Actuation".
EXAMINER'S NOTE:		**With regards to OP-TM-642-904, there are special usage requirements for steps 4.1 through 4.3 These actions are memory items (IAW OS 24) and performed from memory when required. The sequence of actuation and verification of ES is not train dependent. Either train may be performed first or trains may be performed in parallel.**
		OP-TM-642-904 "Reactor Trip Isolation ESAS Actuation
	URO	Step 4.1 initiates OP-TM-244-901 "Containment Isolation".
		OP-TM-244-901, CONTAINMENT ISOLATION
	URO	Step 4.2.15.1: Determines that NSCCW line break was required, and then performs the following: Ensures NS-V-15 is Closed by pressing the closed pushbutton and verifying green light lit, red light not lit (CC) and blue light lit, amber light not lit (PCR)

Op Test No.:	1	Scenario #	5	Event #	7,8	Page	29 of 29
Event Description:	RCS LOCA, Loss of Subcooling Margin						

Time	Position	Applicant's Actions or Behavior
EXAMINER'S NOTE:		**NS-V-4 and NS-V-15 are valves in series, one on each side of containment. Procedurally, only one of the valves are required to be closed. The URO may close both based on OS-24 criteria.**
CT-19	URO	Step 4.2.15.2: Determines that NSCCW line break was required, and then performs the following: Ensures NS-V-4 and/or NS-V-35 is/are Closed by pressing the closed pushbutton(s) and verifying green light lit, red light not lit (for each) (CC) and blue light lit, amber light not lit (for each) (PCR)
EXAMINER'S NOTE:		**Scenario can be terminated when the NSCCW Containment Isolation Valves are closed and the OTSG's are being maintained 75%-85% in the Operating Range.**

Follow-up question highest event entered during scenario?

Answer: FA1, RCS2.a.1 and RCS2.d.1

FA1 - Reactor Coolant System - Loss

EAL Threshold Values:

RCS leakage results in < 25°F Sub-Cooled Margin